امتحانات رقم (1)







Questions of  2021 Exam

Answered

Choose the correct answer for the following questions :

1 **The properties of the cathode rays differ from those of alpha rays in ....**

ⓐ that they can be observed through flashes.

ⓑ that they both move in straight lines.

ⓒ that they both are particles.

ⓓ the direction of their deflection in an electric field.

2 **Bohr's and Rutherford's models are similar in that ....**

ⓐ the electron can gain a quantum of energy.

ⓑ the electron can not be found within the regions between the energy levels.

ⓒ the electron orbits the nucleus in definite constant orbits.

ⓓ the electron is a negatively charged particle.

3 **Which of the following properties is not among those of the line spectrum ?**

ⓐ It consists of coloured lines separated by lighted areas.

ⓑ It arises from the return of the excited electron to its level.

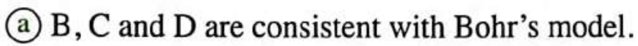
ⓒ It is produced through heating the atoms of the elements in the state of gas or vapour.

ⓓ Each element has a characteristic line spectrum.

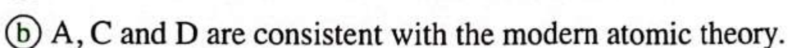
4 **The opposite figure shows the probabilities of finding the electron in the atom.**

The most accurate choice is ....

+ A B C D K L M



ⓐ B, C and D are consistent with Bohr's model.



ⓑ A, C and D are consistent with the modern atomic theory.

ⓒ B, C and D are consistent with the modern atomic theory.

ⓓ A, B and C are consistent with Bohr's model.

5 **Among the modifications of the wave mechanical theory on Rutherford's model is ....**

ⓐ that the nucleus of the atom is positively charged.

ⓑ that the atom is electrically neutral.

ⓒ that the atom is not solid but contains a vast space.

ⓓ the probability of finding the electron in the spaces around the nucleus.

6 The values of the sublevels of a principal energy level are up to 2
This principal level is ....

ⓐ L
ⓑ N
ⓒ K
ⓓ M

7 The electron configuration of an atom ends with the sublevel $4d^2$, the number of the orbitals which are occupied by electrons in the principal level $n = 4$ is ....

ⓐ 7
ⓑ 4
ⓒ 6
ⓓ 5

8 If $\ell = 2$, then the values of m_ℓ and m_s of the first electron in the sublevel are ....

ⓐ $m_\ell = +2$, $m_s = +\frac{1}{2}$
ⓑ $m_\ell = -1$, $m_s = -\frac{1}{2}$
ⓒ $m_\ell = -2$, $m_s = +\frac{1}{2}$
ⓓ $m_\ell = +1$, $m_s = +\frac{1}{2}$

9

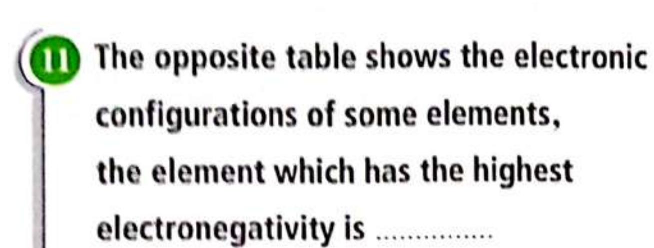
Element	$_{12}A$	$_{11}B$
First ionization potential (kJ/mol)	+732	+495
Second ionization potential (kJ/mol)	+1451	+4558

The second ionization potential of element (B) is much higher than the second ionization potential of element (A), this is attributed to ....

ⓐ losing 2 electrons from the principal level L in (B).
ⓑ breaking the principal level L in (B) and the increase of the positive charge.
ⓒ breaking the principal level L in (A) and the increase of the positive charge.
ⓓ losing 2 electrons from the principal level M in (A).

10 4 elements are located in one group starting from the second period in the periodic table, so the electron affinity of the element whose electron configuration is $1s^2, 2s^2, 2p^6, 3s^1$ equals ....

ⓐ –53 kJ/mol
ⓑ –60 kJ/mol
ⓒ –48 kJ/mol
ⓓ –47 kJ/mol



11 The opposite table shows the electronic configurations of some elements, the element which has the highest electronegativity is ....

Element	Electronic configuration
X	$[_{10}Ne] : 3s^2 , 3p^5$
Y	$[_{10}Ne] : 3s^2 , 3p^2$
Z	$[_{18}Ar] : 4s^2 , 3d^{10} , 4p^5$
R	$[_{36}Kr] : 5s^2 , 4d^{10} , 5p^5$

(a) Y
(b) X
(c) R
(d) Z

12 The opposite table shows the quantum numbers of the last electron in the atoms of some elements.
Which of these elements is electronegative ?

Element	Quantum numbers
X	$n = 3 , l = 0 , m_l = 0 , m_s = +\frac{1}{2}$
Y	$n = 2 , l = 1 , m_l = +1 , m_s = -\frac{1}{2}$
Z	$n = 2 , l = 1 , m_l = -1 , m_s = -\frac{1}{2}$
R	$n = 3 , l = 0 , m_l = 0 , m_s = -\frac{1}{2}$

(a) Y
(b) X
(c) R
(d) Z

13 The ion X^{3+} electronic configuration ends with $6s^0 , 4f^{14} , 5d^8$
This means that element (X) is located in the group ....

(a) 8 (b) 10
(c) 11 (d) 9

14 The opposite table shows the outer electron configurations of some elements.
Which of the following is correct ?

Element	The outer electron configuration
A	$4s^1$
B	$3p^5$
C	$4p^5$

(a) HC is more acidic , and (A) has the largest radius.
(b) HB is more acidic , and (C) has the largest radius.
(c) HC is more basic, and (B) has the smallest radius.
(d) HB is more basic, and (A) has the smallest radius.

15 4 elements in the same group their radii are estimated in angstroms.

A	B	C	D
1.96	2.27	1.52	2.48

Which of the following is correct ?

ⓐ Element (C) has lower electron affinity than element (A).

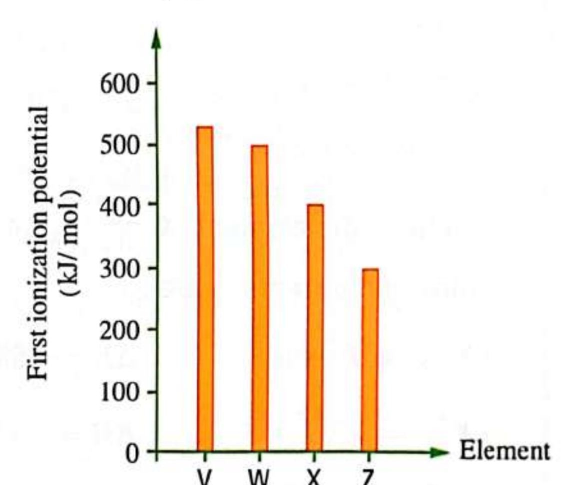
ⓑ Element (A) has lower electronegativity than element (B).

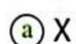
ⓒ Element (D) has higher electronegativity than element (C).

ⓓ Element (B) has higher ionization potential than element (D).

16 Assisted by the opposite diagram which shows the values of the first ionization potentials of elements of the same group in the periodic table.

The element with the highest metallic property is ....




ⓐ X

ⓑ Z

ⓒ V


ⓓ W

17 The opposite table shows the electronic configuration of the last sublevel in some elements.

Element	A	B	C	D
The electrons of the last sublevel	$3p^1$	$3p^5$	$3p^3$	$3p^4$

Which of the following is correct ?

ⓐ (B) is a nonmetal and its electron affinity is high.

ⓑ (C) is a metal and its electron affinity is high.

ⓒ (A) is a nonmetal and its electron affinity is low.

ⓓ (D) is a metal and its electron affinity is low.

18 According to the equation : $X + e^- \longrightarrow X^- + \text{High energy}$

Among the properties of element (X) that ....

ⓐ its oxide is amphoteric, and its ionization potential is high.

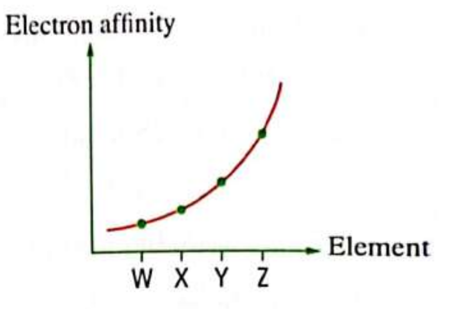
ⓑ its oxide is basic, and its ionization potential is high.

ⓒ its oxide is acidic, and its ionization potential is high.

ⓓ its oxide is acidic, and its ionization potential is low.

19 The opposite curve shows the graduation in the value of electron affinity of 4 elements in the third period (not in successive groups).

The correct order of the oxides of these elements relative to the acidic property is ....



ⓐ Z < Y < X < W

ⓑ X < Y < Z < W

ⓒ Z < W < X < Y

ⓓ W < X < Y < Z

20 You have the element (X) which is a representative element, and their probable ionization potentials are :

- $X \longrightarrow X^{+} + e^{-}$, $\Delta H = +500$ kJ/mol
- $X^{+} \longrightarrow X^{+2} + e^{-}$, $\Delta H = +675$ kJ/mol
- $X^{+2} \longrightarrow X^{+3} + e^{-}$, $\Delta H = +8780$ kJ/mol

Then, the element which precedes it in the same period is located in ....

ⓐ the first group A

ⓑ the second group A

ⓒ the fourth group A

ⓓ the third group A

21 Three representative elements X , Y and Z are located in one period and three different groups,

the formula of the oxide of each of them is : X_2O , YO_3 and ZO_2

The correct order according to the atomic radius of each of them is ....

ⓐ Z > X > Y

ⓑ X > Z > Y

ⓒ X > Y > Z

ⓓ Z > Y > X

Questions of 2020 Exam

Answered

Choose the correct answer for the following questions :

1 In the equation : $HCl_{(aq)} + HNO_{3(aq)} \longrightarrow NO_{2(g)} + \frac{1}{2}Cl_{2(g)} + H_2O_{(l)}$

Which of the following represents the previous reaction ?

ⓐ Nitrogen undergoes oxidation process.

ⓑ HNO_3 is the reducing agent.

ⓒ Chlorine undergoes reduction process.

ⓓ HCl is the reducing agent.

2 In the equation : $2FeCl_{3(aq)} + H_2S_{(aq)} \longrightarrow 2HCl_{(aq)} + 2FeCl_{2(aq)} + S_{(s)}$

Which of the following represents the previous reaction ?

ⓐ $FeCl_3$ is the oxidizing agent.

ⓑ A reduction process occurs to sulphur.

ⓒ H_2S is the oxidizing agent.

ⓓ An oxidation process occurs to iron.

3 Three different elements, their radii are ordered as follows : X > Z > Y, these elements form the following acids : HXO, H_4YO_4, H_2ZO_2

What is the correct ascending order of the strengths of these acids ?

ⓐ $H_4YO_4 < H_2ZO_2 < HXO$

ⓑ $H_2ZO_2 < H_4YO_4 < HXO$

ⓒ $H_2ZO_2 < HXO < H_4YO_4$

ⓓ $HXO < H_2ZO_2 < H_4YO_4$

4 In the compound $C(OH)_4$, the attraction between (O , C) is equal to the attraction between (O , H), so this compound is ionized ....

ⓐ in water as a salt.

ⓑ according to the type of the medium.

ⓒ in basic medium as a base.

ⓓ in acidic medium as an acid.

5 In helium atom $_2He$, ...

ⓐ the values of the spin quantum number are similar.

ⓑ $m_l = 1$

ⓒ the values of the spin quantum number are different.

ⓓ $m_l = -1$

6 The electronic configuration of the element (X) ends as follows : ns^1 , $(n-1)d^5$, and its electrons are distributed in 5 principal levels.

What is the atomic number of this element ?

ⓐ 29 ⓑ 24

ⓒ 47 ⓓ 42

7 Sr element is located in the fifth period, group (2A) in the modern periodic table.

Which of the following represents the electronic configuration of its ion ?

ⓐ [Ar] , $4s^2$, $3d^{10}$, $4p^6$ ⓑ [Ar] , $4s^2$

ⓒ [Kr] , $5s^2$, $4d^{10}$, $5p^4$ ⓓ [Kr] , $5s^2$

8 In terms of the opposite table, if the length of the bond (C – Br) in CBr_4 = 1.91 Å

Bond	F – F	Br – Br
Bond length	1.28 Å	2.28 Å

What is the length of the bond in CF_4 ?

ⓐ 1.14 Å ⓑ 1.41 Å

ⓒ 0.77 Å ⓓ 0.64 Å

9 Four ions : $_{19}M^{+}$, $_{4}Z^{2+}$, $_{12}Y^{2+}$, $_{37}X^{+}$

What is the correct ascending order of their atomic radii ?

ⓐ Z < Y < X < M ⓑ Y < Z < M < X

ⓒ X < M < Y < Z ⓓ Z < Y < M < X

10 Which of the following choices is correct for the elements $_{19}X$ and $_{17}Y$?

ⓐ It is easier to reduce (X) than (Y). ⓑ It is easier to oxidize (Y) than (X).

ⓒ Both (X) and (Y) can be easily reduced. ⓓ It is easier to oxidize (X) than (Y).

11 The opposite table shows some properties of the elements (X) and (Y) which are located in the second period in the periodic table.

Property	(X)	(Y)
Electron affinity	Low	High
Ionization potential	Low	High
Oxidation number	+3	–2

Which of the following statements is correct ?

ⓐ Element (Y) is located in group (6A).

ⓑ Element (X) is located in group (2A).

ⓒ Element (X) is located in group (6A).

ⓓ Element (Y) is located in group (2A).

12 **The element whose last principal energy level (n = 3) contains 6 electrons forms ....**

ⓐ an amphoteric oxide.
ⓑ an acidic oxide.
ⓒ a neutral oxide.
ⓓ a basic oxide.

13 **The highest amount of energy is released when the excited electron of hydrogen atom transfers from ....**

ⓐ the orbit M to the orbit L, and the location of this electron can be determined.
ⓑ the orbit N to the orbit M, and neither the location nor the speed of this electron can be determined precisely.
ⓒ the orbit L to the orbit K, and this electron has a dual nature.
ⓓ the orbit L to the orbit K, and both the location and the speed of this electron can be determined precisely.

14 **Element (X) is located in the group (4A).**
Which of the following its electron affinity is the highest ?

ⓐ X^-
ⓑ X
ⓒ X^+
ⓓ X^{2-}

15 **On comparing the properties of the elements of the group whose electronic configuration ends with ns^1 to the properties of the other elements, it is noticed that ....**

ⓐ their oxides are basic and their electron affinities are high.
ⓑ their oxides are acidic and their electron affinities are low.
ⓒ their oxides are basic and their electron affinities are low.
ⓓ their oxides are amphoteric and their electron affinities are high.

16 **What are the values of both principal and magnetic quantum numbers of the penultimate electron in sodium atom $^{23}_{11}Na$?**

ⓐ n = 3 , $m_l = +2$
ⓑ n = 3 , $m_l = -1$
ⓒ n = 2 , $m_l = +1$
ⓓ n = 2 , $m_l = -2$

17 **The opposite table shows the radii of four different atoms. Which element among these elements has the highest electronegativity ?**

Element	A	B	C	D
Atomic radius	1.34 Å	2.11 Å	0.73 Å	1.74 Å

ⓐ A
ⓑ B
ⓒ C
ⓓ D

18 The weakest metal in the group (IIA) in the periodic table is located in the ....

ⓐ sixth period.
ⓑ fifth period.
ⓒ seventh period.
ⓓ second period.

19 What is the type of the elements in which the electron configuration ends with $ns^{1:2}$, $np^{1:5}$?

ⓐ Representative.
ⓑ Main transition.
ⓒ Inner transition.
ⓓ Noble.

20 In the equation : $MOH \rightleftharpoons MO^- + H^+$

If the values presented in the following choices represent the first ionization potentials of the first four elements in the same period «with no particular order». What is the value of the first ionization potential of (M) ?

ⓐ +580 kJ/mol
ⓑ +1400 kJ/mol
ⓒ +780 kJ/mol
ⓓ +520 kJ/mol

21 The probability of the presence of the electron around the nucleus is represented by ....

ⓐ the orbital and the electron cloud.
ⓑ the quantum and the line spectrum.
ⓒ the line spectrum and the orbital.
ⓓ the quantum and the electron cloud.

22 Dalton and Thomson agreed on that carbon atom ....

ⓐ has no spaces within it.
ⓑ is electrically neutral.
ⓒ contains negative electrons.
ⓓ is a homogenous sphere.

23 The modern atomic theory agrees with Rutherford's atomic model on ....

ⓐ that the atom is not solid.
ⓑ that the electrons have wave properties.
ⓒ that it is impossible to determine both the location and the speed of the electron together precisely.
ⓓ the system of the revolving of the electrons around the nucleus.

24 The opposite table shows the ionization potentials of three metals in the same period in the modern periodic table.
What is the proper graduation of the metallic character of these elements ?

Element	A	B	C
Ionization potential (kJ/mol)	2800	1500	700

ⓐ B < C < A ⓑ A < C < B
ⓒ C < B < A ⓓ A < B < C

25 Three elements X , Y and Z, their electronic configurations end with ns^1.
and the values of their electron affinities are ordered as follows : Z > Y > X
What is the correct order of graduation of their metallic character ?

ⓐ Y < Z < X ⓑ Z < X < Y
ⓒ Y < X < Z ⓓ Z < Y < X

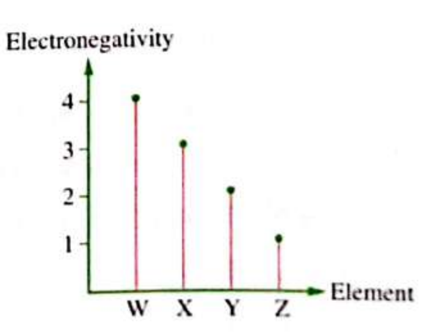
26 According to Hund's rule and Pauli's exclusion principle, the last two electrons which have the highest energy in the atom of the element $_{26}X$ are different in both quantum numbers ....

ⓐ ℓ and m_ℓ ⓑ n and m_ℓ
ⓒ m_s and ℓ ⓓ m_s and m_ℓ

27 Bohr's atomic model differs from that of Rutherford.
What is the postulate in Bohr's model which clarifies this difference ?

ⓐ The electron displays a line spectrum when it loses a quantum.
ⓑ The electron is a negatively charged material particle.
ⓒ The electron does not display a line spectrum when it loses a quantum.
ⓓ The electron revolves around the nucleus in certain orbits.

28 In the opposite graphical figure :
Which of these elements has lower electron affinity ?



ⓐ X
ⓑ Y
ⓒ Z
ⓓ W

29 What is the symbol of the energy level which contains *s* , *p* and *d* sublevels only ?

ⓐ L ⓑ M

ⓒ N ⓓ K

30 The first ionization potential of fluorine ($_9F$) is higher than that of oxygen ($_8O$) because ....

ⓐ number of energy levels in fluorine > number of energy levels in oxygen.

ⓑ number of energy levels in fluorine < number of energy levels in oxygen.

ⓒ atomic radius of fluorine > atomic radius of oxygen.

ⓓ atomic radius of fluorine < atomic radius of oxygen.

31 What happens when sodium hydroxide solution is added to aluminum hydroxide ?

ⓐ They don't react together, because they are both acids.

ⓑ $Al(OH)_3$ reacts as a base.

ⓒ They don't react together, because they are both bases.

ⓓ $Al(OH)_3$ reacts as an acid.

32 The electronic configuration of the ion of a trivalent metal is [Ar]. What is the type of this metal ?

ⓐ Main transition. ⓑ Inner transition.

ⓒ Inert. ⓓ Representative.

33 Which of the following statements represents the ionic compound which has the formula Y_2X ?

ⓐ (Y) is a nonmetal, (X) is a metal.

ⓑ (Y) is a nonmetal, (X) is a metalloid.

ⓒ (Y) is located in group (1A), (X) is located in group (6A).

ⓓ (Y) is located in group (6A), (X) is located in group (1A).

34 If the ions A^{2+} , B^{2-} are of two elements in the same period. Which of the following choices represents a comparison between the electronegativities of the two elements of these ions ?

ⓐ $A < B$ ⓑ $A \geq B$

ⓒ $A > B$ ⓓ $A = B$

35 **What is the sublevel in which the last electron has the two quantum numbers ($n = 2$, $\ell = 0$) ?**

ⓐ *2s* ⓑ *2p*

ⓒ *1s* ⓓ *3p*

36 **The orbitals of the same sublevel are different in ....**

ⓐ the distance from the nucleus. ⓑ the magnetic quantum number.

ⓒ shape and size. ⓓ the subsidiary quantum number.

37 **What is the number of orbitals occupied by electrons in an atom in which *3p* sublevel is half filled with electrons ?**

ⓐ 6 ⓑ 7

ⓒ 8 ⓓ 9

38 **When an electron transfers from the level K to the level L, it gains one quantum, and when it transfers from K to N, it gains ....**

ⓐ 0.5 quantum. ⓑ 1 quantum.

ⓒ 2 quanta. ⓓ 3 quanta.

39 **Among Heisenberg's modifications of Bohr's atomic model ....**

ⓐ it is difficult to determine both the location and the speed of the electron together around the nucleus precisely.

ⓑ the space regions between energy levels are not forbidden for the electrons.

ⓒ the electron is a material particle with wave properties.

ⓓ both the location and the speed of the electron can be determined precisely.



Answered

Choose the correct answer for the following questions :

1 The opposite table shows the atomic radii of four elements in the same group in the periodic table estimated in angstroms. Which of the following is correct ?

Element	(A)	(B)	(C)	(D)
Atomic radius (Å)	1.96	2.27	1.52	2.48

ⓐ Element (A) has lower electronegativity than that of element (B).
ⓑ Element (D) has higher electronegativity than that of element (C).
ⓒ Element (C) has lower electron affinity than that of element (A).
ⓓ Element (B) has higher ionization potential than that of element (D).

2 Bohr's atomic model is distinct from that of Rutherford in that the electrons in Bohr's model ....

ⓐ revolve in certain orbitals.
ⓑ revolve in definite constant energy levels.
ⓒ revolve in high speed.
ⓓ revolve around the nucleus.

3 If the electron gains an amount of energy equals 10.2 eV to transfer from the energy level K to L, so to transfer from the energy level M to L It may ....

ⓐ lose an amount of energy equals 1.89 eV
ⓑ gain an amount of energy equals 1.89 eV
ⓒ lose an amount of energy equals 10.2 eV
ⓓ gain an amount of energy equals 10.2 eV

4 The second and third ionization potentials of the element (X) are represented by the following equations :

- $X^{+}_{(g)} \longrightarrow X^{2+}_{(g)} + e^{-}$ $\Delta H = +1450$ kJ/mol
- $X^{2+}_{(g)} \longrightarrow X^{3+}_{(g)} + e^{-}$ $\Delta H = +7730$ kJ/mol

It is concluded from these two equations that the element (X) compared to the element which precedes it in the same period is ....

ⓐ a nonmetal with lower ionization potential
ⓑ a nonmetal with higher ionization potential
ⓒ a metal with lower ionization potential
ⓓ a metal with higher ionization potential

5 **Two elements (X) and (Y) are located in the same period, their radii are (0.157 Å) and (1.04 Å).**

It is possible when they combine chemically that ....

ⓐ element (X) undergoes oxidation and element (Y) undergoes reduction.

ⓑ element (X) and element (Y) both undergo oxidation.

ⓒ element (X) undergoes reduction and element (Y) undergoes oxidation.

ⓓ neither element (X) nor element (Y) undergoes reduction.

6 **What is the drawback of Bohr's model which was modified by the modern atomic theory ?**

ⓐ The electron has wave nature only.

ⓑ The electron is just a negatively charged particle.

ⓒ The electron has dual nature.

ⓓ The electron revolves around the nucleus in an electron cloud.

7 **The opposite table shows the electronic configurations of the atoms and ions of some elements.**

Which of the following choices represents the correct graduation of the electronegativities of these elements ?

Atom or ion	Electronic configuration
A^{1-}	[Ne]
B^{2-}	[Ne]
C	[Ar], $4s^1$
D	[Ne], $3s^1$

ⓐ A > B > D > C

ⓑ B > C > A > D

ⓒ D > C > B > A

ⓓ A > D > C > B

8 **Each of hydrogen and helium contains one energy level.**

Which of the following describes the two elements ?

ⓐ The two elements are different in their line spectra.

ⓑ The two elements are equal in the number of electrons in each of them.

ⓒ The two elements are different in the principal quantum number of their valence electrons.

ⓓ The two elements are similar in their line spectra.

9 **By applying the wave mechanical equation to the last electron in sodium atom $_{11}Na$ It is found that ....**

ⓐ it is possible to determine its location precisely in the energy level M

ⓑ it moves back and forth from the nucleus within the energy level M

ⓒ its energy is lower than that of the electrons of the energy level L

ⓓ it transfers to the energy level L after losing a quantum.

10 **To obtain the hydrogen atom visible spectrum of an electron which has been excited to the third energy level M, this electron must ....**

ⓐ lose a quantum lower than that gained.

ⓑ lose a quantum which is gained.

ⓒ gain a quantum.

ⓓ lose a quantum higher than that gained.

11 **The electronic configuration of the element (X) ends with $3p^1$ sublevel. Which of the following choices represents the element (X) relative to the elements which precede it in the same period ?**

ⓐ A nonmetal with high electron affinity.

ⓑ A nonmetal with low electron affinity.

ⓒ A metal with high electron affinity.

ⓓ A metal with low electron affinity.

12 **The electron configuration of element (X) ends with the sublevels : $5s^2, 4d^{10}, 5p^5$ Which of the following choices represents the element (X) relative to the elements which precede it in the same period ?**

ⓐ Its oxide is basic and its ionization potential is small.

ⓑ Its oxide is amphoteric and its ionization potential is high.

ⓒ Its oxide is acidic and its ionization potential is high.

ⓓ Its oxide is acidic and its ionization potential is small.

Exam model 1  Open Book

Answered

- Choose the correct answer for the questions 1 : 21

1 Three consecutive elements X , Y and Z in the periodic table, if the first element X is a noble gas. What is the symbol of the ion of Z ?

(a) Z^{2-}
(b) Z^{2+}
(c) Z^{-}
(d) Z^{+}

2 Here are 4 hypothetical symbols for four elements ions : (A^{2+} / B^{-} / C^{+} / D^{2+}). Which of the following statements represents all these ions ?

(a) The number of electrons in each of them is higher than that of the protons.
(b) Their nuclei contain the same number of neutrons.
(c) Their nuclei contain the same number of protons.
(d) The electronic configuration of each of them is similar to that of the nearest inert gas.

3 Element (X) burns in air forming white powder which when dissolved in water, it forms a solution turns the red litmus paper into blue. What is the probable name of this element ?

(a) Sulphur.
(b) Iodine.
(c) Carbon.
(d) Magnesium.

4 In which of the following ions the electron cloud has the largest size ?

(a) S^{2-}
(b) Al^{3+}
(c) Be^{2+}
(d) N^{3-}

5 What is the number of electrons lost or gained by nitrogen atom in this conversion : $NO_2 \longrightarrow N_2O_3$?

(a) It loses one electron.
(b) It loses two electrons.
(c) It gains one electron.
(d) It gains two electrons.



6 Which of the following is incompatible with aufbau principle ?

(a) [↑↓] [↑ | ↑ | ↑]

(b) [↑↓] [↑↓ | ↑↓ | ↑]

(c) [↑] [↑↓ | ↑ | ↓]

(d) [↑↓ | ↑ | ↑]

7 Which of the following represents both the location and the block of the element whose atomic number is 24 ?

Choices	Period	Group	Block
(a)	6	4B	d
(b)	4	6B	d
(c)	6	4B	p
(d)	4	6B	p

8 What is the number of the elements which may form compounds but with great difficulty in the fourth period in the periodic table ?

(a) 1 (b) 2 (c) 3 (d) 4

9 What is the number of the elements in which the orbitals of *4d* sublevel contain one single (unpaired) electron or more in the ground state ?

(a) 7
(b) 8
(c) 9
(d) 10

10 Which of the following choices represents the electronic configuration of the atom which has higher electron affinity ?

(a) [Ne], $3s^2$, $3p^5$
(b) [Ne], $3s^2$, $3p^2$
(c) [Ne], $3s^2$, $3p^6$, $3d^5$, $4s^1$
(d) [Ne], $3s^2$, $3p^4$

11 Which of the following elements has the highest electronegativity ?

(a) $_{13}Al$
(b) $_{14}Si$
(c) $_{16}S$
(d) $_{34}Se$

12 Which of the following elements has the lowest first ionization energy ?

(a) $_{5}B$
(b) $_{6}C$
(c) $_{13}Al$
(d) $_{14}Si$

13 Which choice does represent the correct graduation in increasing the metallic property ?

ⓐ ${}_{14}Si < {}_{15}P < {}_{16}S$

ⓑ ${}_{33}As < {}_{15}P < {}_{7}N$

ⓒ ${}_{13}Al < {}_{32}Ge < {}_{51}Sb$

ⓓ ${}_{35}Br < {}_{34}Se < {}_{33}As$

14 Two ions (X^-) and (Y^+), both have the same electron configuration [Ar].

Which of the following statements represents the two elements of these ions ?

ⓐ The atomic radius of element (X) equals half that of element (Y).

ⓑ The electronegativity of element (X) equals that of element (Y).

ⓒ The first ionization potential of element (X) is lower than that of element (Y).

ⓓ The electron affinity of element (Y) is lower than that of element (X).

15 Which of the following transitions in an atom of hydrogen produces a photon with the highest energy ?

ⓐ $(n = 3) \longrightarrow (n = 1)$

ⓑ $(n = 5) \longrightarrow (n = 3)$

ⓒ $(n = 12) \longrightarrow (n = 10)$

ⓓ $(n = 22) \longrightarrow (n = 20)$

16 Which of the following represents an electron configuration of an excited atom ?

ⓐ $1s^2, 2s^2, 2p^1$

ⓑ $1s^2, 2s^2, 2p^2$

ⓒ $1s^2, 2s^2, 2p^2, 3s^1$

ⓓ $1s^2, 2s^2, 2p^5$

17 In the reaction : $ClO_3^- + 5Cl^- + 6H^+ \longrightarrow 3Cl_2 + 3H_2O$

What are the oxidizing and the reducing agents ?

Choices	Oxidizing agent	Reducing agent
ⓐ	Cl^-	ClO_3^-
ⓑ	ClO_3^-	Cl^-
ⓒ	ClO_3^-	H^+
ⓓ	Cl^-	H^+

18 Which of the following elements atoms in its ground state could have an electron with the quantum numbers : ($n = 3$, $\ell = 2$, $m_\ell = 0$, $m_s = +\frac{1}{2}$) ?

ⓐ $_{11}Na$ ⓑ $_{12}Mg$

ⓒ $_{15}P$ ⓓ $_{23}V$

19 6 g of carbon react completely with 16 g of oxygen gas to form 22 g of CO_2 What is the mass of CO_2 which is produced from a mixture formed of 24 g of carbon with 100 g of oxygen gas ?

ⓐ 40 g ⓑ 44 g

ⓒ 88 g ⓓ 112 g

20 All the following are deflected by the effect of the charged plates, except ....

ⓐ hydrogen atoms.

ⓑ cathode rays.

ⓒ alpha particles.

ⓓ protons.

21 What is the name of the halogen which is located in the third period in the periodic table ?

ⓐ Chlorine $_{17}Cl$

ⓑ Iodine $_{53}I$

ⓒ Bromine $_{35}Br$

ⓓ Astatine $_{85}At$

22 **Deduce with explanation** the oxidation number of the representative element whose last electron has the quantum numbers : ($\ell = 0$, $m_s = -\frac{1}{2}$).

....

....

....

....

....



23 **The opposite table** shows the quantum numbers of two different electrons in the same atom. **Which of them has higher energy ? Explain.**

Quantum numbers	(n)	(l)	(m_l)	(m_s)
Electron (X)	4	3	0	$+\frac{1}{2}$
Electron (Y)	6	0	0	$+\frac{1}{2}$

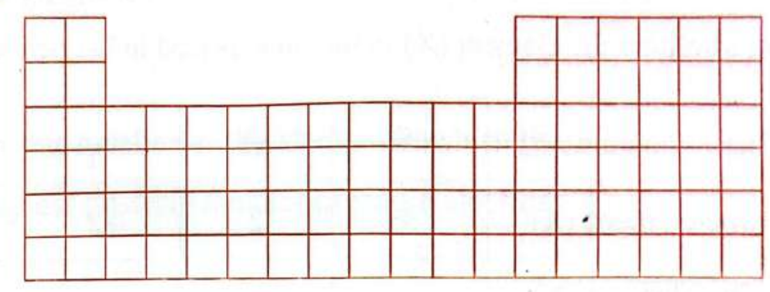
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.... 2 marks

24 **The following figure represents a section in the periodic table :**



(1) Calculate the difference between the number of the elements of s-block and the number of the elements of p-block.

....

....

(2) What is the missing block in this table ?

....



25 **Which of the following graphical figures represents** the graduation of the basic property of the oxides of the elements of the third period in the periodic table ?

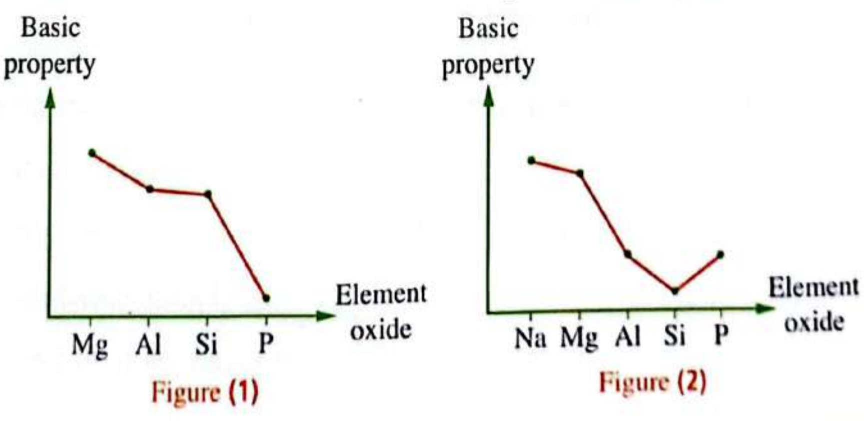


Figure (1)

Figure (2)

.... 1 mark

26 **What is the number of each of the completely filled orbitals** and the partially occupied by electrons in the gaseous state of the atom of vanadium element $_{23}V$ in its ground state ?

....

....

....

....

.... / 1 mark

27 **Complete the four quantum numbers** of the last electron in the element (Y), knowing that it follows the element (X) in the same period in the periodic table :

Quantum numbers	(n)	(l)	(m_l)	(m_s)
The element (X)	3	2	+2	$-\frac{1}{2}$
The element (Y)	....	....	....	....



Exam model 2  Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 What is the number of the inner transition elements in both fourth and fifth periods in the periodic table ?

ⓐ Zero ⓑ 14 ⓒ 24 ⓓ 28

2 If aufbau principle is disregarded in distributing the electrons of the elements. $_{20}Ca$ would be located in ....

ⓐ s-block. ⓑ p-block. ⓒ d-block. ⓓ f-block.

3 What is the atomic number of the element in which the orbitals of *4p* sublevel contain the highest possible number of single electrons ?

ⓐ 23 ⓑ 26
ⓒ 33 ⓓ 35

4 Which of the following elements has the highest ionization potential ?

ⓐ Ne ⓑ He
ⓒ Be ⓓ Te

5 In Rutherford's experiment, upon shooting a beam of ....

ⓐ beta particles on gold foil, it is absorbed.
ⓑ gamma rays on gold foil, electrons are liberated from its surface.
ⓒ helium atoms on gold foil, most of them are scattered.
ⓓ helium nuclei on gold foil, some of them are scattered.

6 Understanding the movement of the electrons in the atom is based on all the following, except ....

ⓐ Rutherford's experiment which proved the presence of the nucleus.
ⓑ Thomson's atomic model.
ⓒ Bohr's model of atom which is based on hydrogen atom.
ⓓ Schrödinger's equation which introduced the concept of the orbital.



7 The weakest halogen acid is ....

ⓐ HBr ⓑ HI ⓒ HF ⓓ HCl

8 What is the number of the orbitals which can be occupied by electrons in the atoms of the elements located in the sixth period in the periodic table, where the electron has the quantum number ($m_l = +3$) ?

ⓐ 1 ⓑ 3 ⓒ 5 ⓓ 7

9 One of the students presumed wrongly that the two electrons (X) and (Y) which are in the same atom have the following quantum numbers :

- Electron (X) : $n = 4$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$
- Electron (Y) : $n = 4$, $l = 0$, $m_l = 0$, $m_s = +\frac{1}{2}$

What is the rule or the principle which explains this mistake ?

ⓐ Pauli's exclusion principle. ⓑ Aufbau principle.

ⓒ Hund's rule. ⓓ Uncertainty principle.

10 Which of the following equations represents the electron affinity of bromine ?

ⓐ $Br_{(g)} \longrightarrow Br^+_{(g)} + e^-$ ⓑ $Br_{(g)} + e^- \longrightarrow Br^-_{(g)}$

ⓒ $Br_{2(g)} + e^- \longrightarrow 2Br^-_{(g)}$ ⓓ $Br^+_{(g)} + e^- \longrightarrow Br_{(g)}$

11 Which of the following loses electrons in the redox (oxidation–reduction) reactions ?

ⓐ The substance which undergoes oxidation.

ⓑ The cathode.

ⓒ The oxidizing agent.

ⓓ The atom or the ion whose oxidation number decreases.

12 Which of the following is a correct application of one of the postulates of Dalton's theory ?

ⓐ The atoms of a sample of iron are not necessarily similar.

ⓑ Hydrogen substance is formed of very minute particles called ions.

ⓒ Water is formed from hydrogen and oxygen elements in a constant weight ratio.

ⓓ Carbon and hydrogen elements combine in different weight ratios to form many compounds.

13 On the absence of magnetic field or electric field which affects the tube of the cathode rays, the rays ....

(a) are not formed.
(b) move in straight lines.
(c) become positively charged.
(d) do not glow.

14 Which of the following contains the same number of electrons of nitride ion ?

(a) Na^+
(b) N_2
(c) Cl^-
(d) Ar

15 When an electron transfers from higher energy level to a lower energy level, it produces ....

(a) an absorption spectrum.
(b) an emission spectrum.
(c) α - particles.
(d) gamma rays.

16 Which of the following elements has chemical properties similar to those of magnesium element $_{12}Mg$?

(a) Sulphur $_{16}S$
(b) Calcium $_{20}Ca$
(c) Iron $_{26}Fe$
(d) Chlorine $_{17}Cl$

17 Which of the following represents the possible quantum numbers of the last electron in nickel atom $_{28}Ni$?

(a) $n = 3 , \ell = 2 , m_\ell = -1 , m_s = -\frac{1}{2}$
(b) $n = 3 , \ell = 2 , m_\ell = 0 , m_s = -\frac{1}{2}$
(c) $n = 3 , \ell = 2 , m_\ell = +1 , m_s = -\frac{1}{2}$
(d) $n = 3 , \ell = 2 , m_\ell = +1 , m_s = +\frac{1}{2}$

18 What is the number of the orbitals of (*f*) sublevel in the principal level (n = 3) ?

(a) Zero
(b) 3
(c) 5
(d) 7

19 Which of the following has the smallest radius ?

(a) F^-
(b) Ne
(c) Na^+
(d) Cl^-

20 **What is the name of ClO_4^- ion ?**

ⓐ Chlorite ion.
ⓑ Hypochlorite ion.
ⓒ Perchlorite ion.
ⓓ Perchlorate ion.

21 **The oxidation number of manganese is +3 in** ....

ⓐ $KMnO_4$
ⓑ $Ba(MnO_4)_2$
ⓒ Mn_2O_3
ⓓ MnO

22 **Which of the following represents the quantum numbers of the farthest electron from the nucleus in scandium atom $_{21}Sc$? Explain.**

The first set : $(n = 3 , \ell = 2 , m_\ell = -2 , m_s = +\frac{1}{2})$.

The second set : $(n = 4 , \ell = 0 , m_\ell = 0 , m_s = -\frac{1}{2})$.

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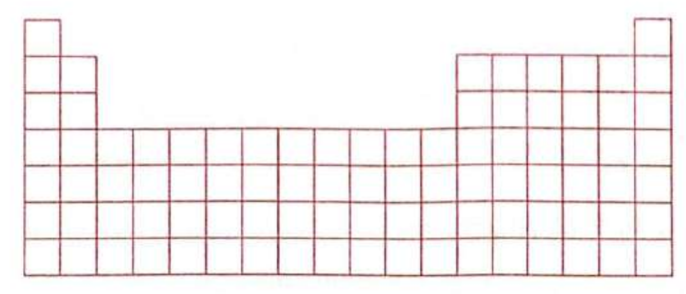
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23 **The following figure represents a section in the periodic table :**



(1) What is the difference between the number of representative elements and the number of the main transition elements ?

....

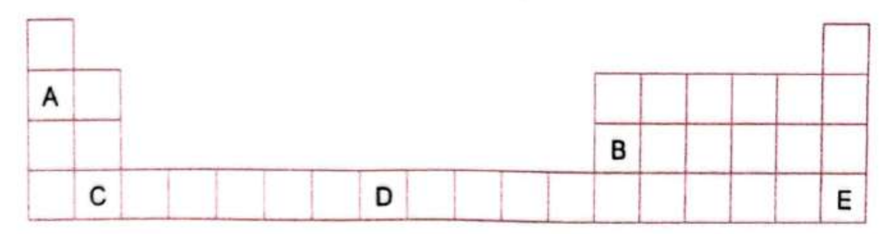
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(2) Shade the location of the element which lies in the fourth period, group (3A).



24 The following table represents a section in the periodic table :



What is the hypothetical symbol of the element which is characterized by that :

(1) Its ion carries two positive charges.

(2) Its electron configuration ends with : $4s^2$, $3d^6$



25 The compound ClO_2 is formed in industry from the reaction of $NaClO_3$ with HCl

Which of the former three compounds is the compound in which the oxidation number of chlorine is the highest ?

....



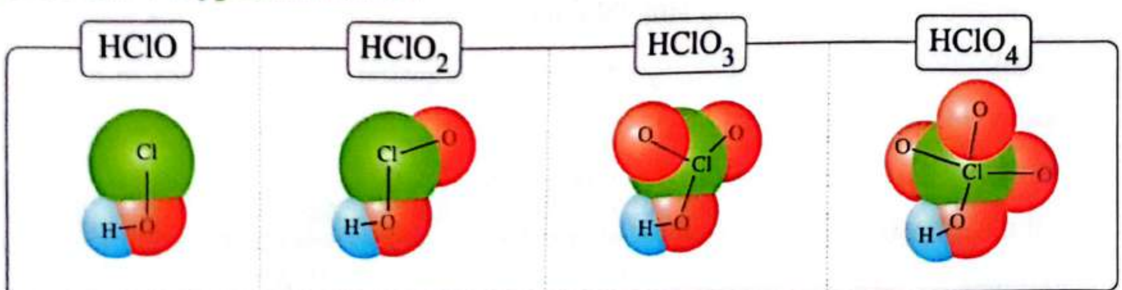
26 Write the balanced symbolic equation which represents the reaction of aluminum oxide with sulphuric acid.

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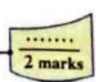


27 Here are 4 oxygenated acids :



Which of these acids has the lowest (n) value ? What is this (n) value ?

....



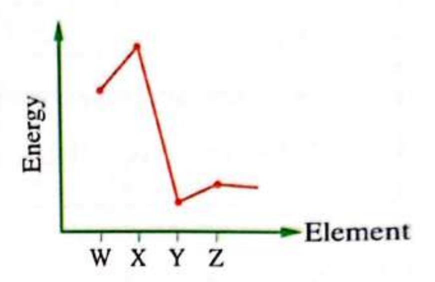
Exam model 3 Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 The opposite figure represents the second ionization potentials of some elements.

Which of them represents $_{3}Li$?





ⓐ W

ⓑ X

ⓒ Y

ⓓ Z

2 Element Q is located in the group (6A) in the periodic table, its nucleus contains x number of neutrons and y number of protons.

Which of the following choices represents the ion of this element ?

ⓐ ${}^{x+y}_{y}Q^{2+}$ ⓑ ${}^{x}_{y}Q^{2+}$ ⓒ ${}^{x+y}_{y}Q^{2-}$ ⓓ ${}^{x}_{y}Q^{2-}$

3 The oxidation number of carbon equal zero in ....

ⓐ CH_4 ⓑ CH_3Br ⓒ $CHBr_3$ ⓓ CH_2Br_2

4 Which of the following is an electron configuration of a stable atom ?

ⓐ [Ne] , $3s^2$, $3p^3$, $4s^1$ ⓑ $1s^2$, $2s^2$, $2p^4$, $4s^2$

ⓒ [Ne] , $3s^2$, $3p^6$, $4s^1$ ⓓ $1s^1$, $2s^1$

5 Which of Dalton's postulates is still valid up till now ?

ⓐ Atoms are minute particles.

ⓑ Atom is indivisible.

ⓒ Atoms of the same element have the same mass.

ⓓ All the atoms of the same element are different in mass from the atoms of the other elements.

6 Which of these ions its electronic configuration is not similar to that of a noble gas ?

ⓐ Cl^- ⓑ Rb^+ ⓒ Sn^{2+} ⓓ Mg^{2+}

7 Which of the following are the oxidation numbers of nitrogen and chlorine (respectively) in $NOClO_4$?

ⓐ +2 and −7 ⓑ −3 and +5 ⓒ +2 and +7 ⓓ +3 and +7

8 Which of the following represents the correct graduation in the properties of the oxides of the elements of the third period ?

Choices	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl_2O_7
ⓐ	Basic	Basic	Amphoteric	Amphoteric	Amphoteric	Acidic	Acidic
ⓑ	Basic	Basic	Amphoteric	Acidic	Acidic	Acidic	Acidic
ⓒ	Basic	Basic	Basic	Amphoteric	Acidic	Acidic	Acidic
ⓓ	Basic	Basic	Amphoteric	Amphoteric	Acidic	Acidic	Acidic

9 What are the quantum numbers (n), (ℓ) of the orbitals which are occupied successively by electrons in all lanthanides ?

ⓐ $n = 4 , \ell = 3$ ⓑ $n = 3 , \ell = 4$

ⓒ $n = 4 , \ell = 1$ ⓓ $n = 5 , \ell = 2$

10 Each of the following matches Pauli's exclusion principle, except ....

ⓐ [↑] [↑↓] [ ][ ][ ] ⓑ [↑↑] [↑↓] [ ][ ][ ]

ⓒ [↑↓] [↑↓] [↑↓][ ][ ] ⓓ [↑↓] [↑↓] [↑][ ][↑]

11 Which of the following oxygenated acids is stronger ?

ⓐ $HClO_2$ ⓑ HNO_2 ⓒ HIO_3 ⓓ HBrO

12 Which of the following choices shows the charge and the location of the electron in the atom ?

Choices	Charge	Present inside the nucleus
ⓐ	Negative	No
ⓑ	Negative	Yes
ⓒ	Positive	No
ⓓ	Positive	Yes

13 **The line spectrum of sodium contains one coloured line, while the line spectrum of hydrogen contains 4 coloured lines.**

What does this statement indicate ?

(a) Hydrogen molecule is formed of four atoms.

(b) As the power of the spectroscope increases, the number of lines which can be seen increases.

(c) There are four excited electrons in hydrogen atom.

(d) The line spectrum of sodium differs from the line spectrum of the other elements.

14 **According to the modern atomic theory, ...**

(a) the electron can not be found in the same place two successive times.

(b) the electrons need to absorb energy photons continuously to move to higher levels.

(c) the charge of the electron = 1.602×10^{-19} C

(d) it is impossible to determine the position and the velocity of the electron precisely at the same time.

15 **Which of the following sets of quantum numbers is not possible ?**

(a) $n = 2, \ell = 0, m_\ell = +1$

(b) $n = 2, \ell = 1, m_\ell = +1$

(c) $n = 2, \ell = 0, m_\ell = 0$

(d) $n = 2, \ell = 1, m_\ell = -1$

16 **Which of the following represents the electronic configuration of manganese (III) ion ?** **(Mn atomic number = 25)**

(a) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^4$

(b) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^2$

(c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^2, 4s^2$

(d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^6, 4s^2$

17 **Which of the following is correct ?**

(a) The elements in the same group have the same number of electrons in the energy levels.

(b) The elements in the periodic table are ordered according to increasing the number of their protons.

(c) The metals are on the right and the nonmetals are on the left of the periodic table.

(d) Active elements are located at the bottom of every group in the periodic table.

18 **Which of the following groups its elements electronic configurations end with : ns^2 , np^1 ?**

ⓐ 1A ⓑ 2A

ⓒ 3A ⓓ 4A

19 **Which of the following chemical processes is impossible to occur ?**

ⓐ $Ca_{(g)} + Energy \longrightarrow Ca^{2+}_{(g)} + 2e^-$

ⓑ $K_{(g)} + e^- \longrightarrow K^+_{(g)} + Energy$

ⓒ $H_{2(g)} + Energy \longrightarrow 2H^+_{(g)} + 2e^-$

ⓓ $Cl_{(g)} + e^- \longrightarrow Cl^-_{(g)} + Energy$

20 **Four different elements : $_{12}A$, $_{4}B$, $_{38}C$, $_{56}D$**

Why do these elements belong to the same group in the modern periodic table ?

ⓐ Because they are all metals which can combine with oxygen forming oxides with a general formula MO

ⓑ Because they are all nonmetals which can form ions with the symbol M^{2-}

ⓒ Because they are all nonmetals whose valence shells contain 2 electrons.

ⓓ Because they are all metals whose atoms electron configurations end with ns^2

21 **Chlorine replaces iodide ion in potassium iodide solution according to the equation : $Cl_2 + 2I^- \longrightarrow I_2 + 2Cl^-$**

What is the oxidizing agent in this reaction ?

ⓐ Chloride ions.

ⓑ Chlorine gas.

ⓒ Iodide ions.

ⓓ Iodine vapours.

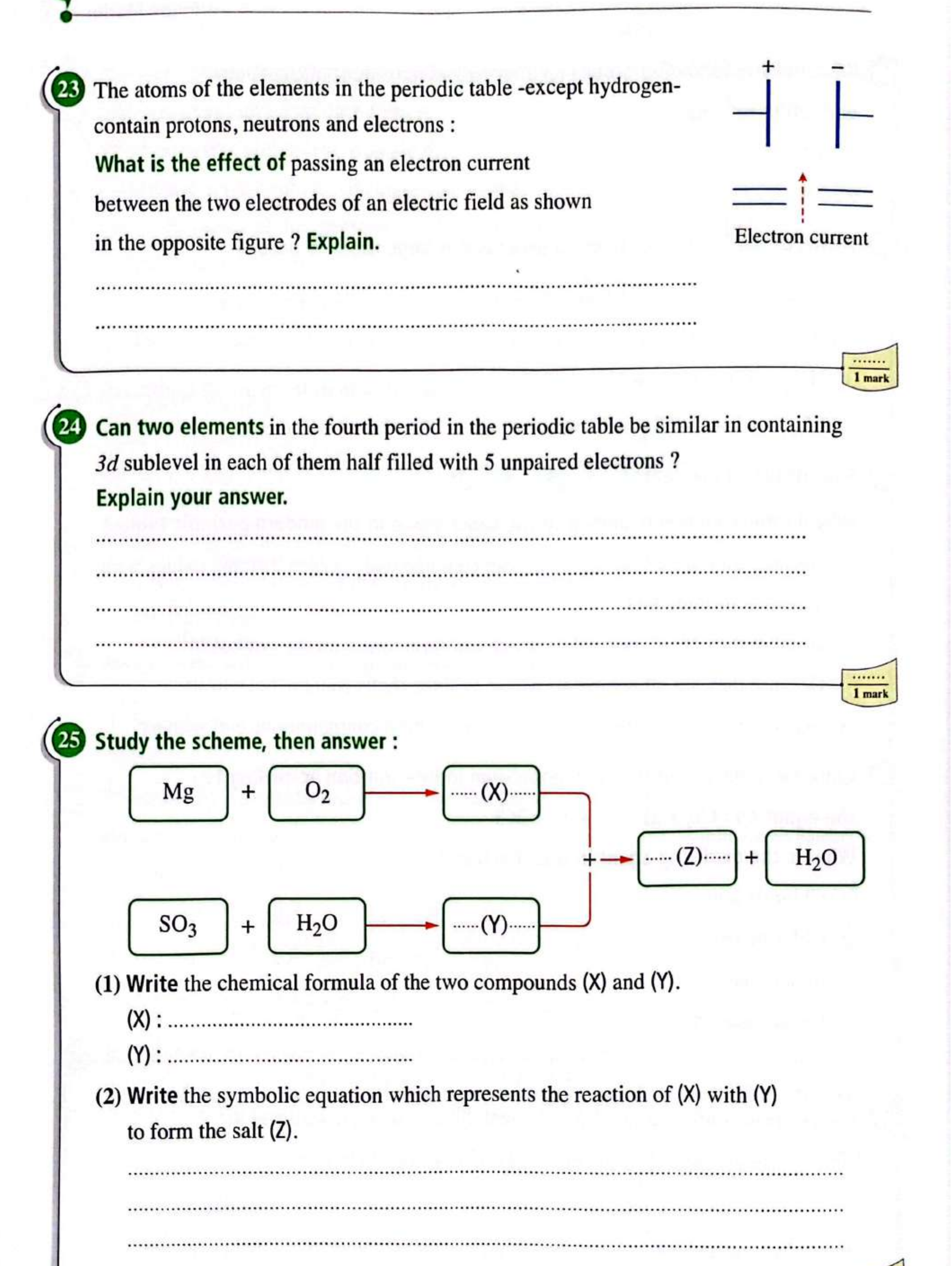
22 The electron configuration of the element (X) ends with the sublevel $4s^1$

What is the product of ionization of XOH in water ? Explain.

....

....





23 The atoms of the elements in the periodic table -except hydrogen- contain protons, neutrons and electrons :

What is the effect of passing an electron current between the two electrodes of an electric field as shown in the opposite figure ? **Explain.**

....

....

.... 1 mark

24 **Can two elements** in the fourth period in the periodic table be similar in containing *3d* sublevel in each of them half filled with 5 unpaired electrons ?

Explain your answer.

....

....

....

....

.... 1 mark

25 **Study the scheme, then answer :**

(1) **Write** the chemical formula of the two compounds (X) and (Y).

(X) : ....

(Y) : ....

(2) **Write** the symbolic equation which represents the reaction of (X) with (Y) to form the salt (Z).

....

....

....

.... 2 marks



26 **The opposite table shows** the four quantum numbers of the last electron in the atom of each of the element (X) and the element (Y).

Quantum numbers	(n)	(ℓ)	(m_ℓ)	(m_s)
Element (X)	2	1	0	$+\frac{1}{2}$
Element (Y)	6	1	0	$+\frac{1}{2}$

Which of the two elements when its pure vapours are exposed to low pressure in a discharge tube, its last electron becomes excited, and acquires the same quantum numbers of the other element ? **Explain.**

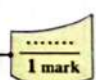
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.... 1 mark



27 **The opposite table illustrates the radii of some atoms and ions.**

H	Cl	Na	Na^+	Cl^-
0.3 Å	0.99 Å	1.57 Å	0.95 Å	1.81 Å

Calculate the bond length in each of :

(1) Hydrogen chloride molecule.

....

(2) Sodium chloride formula unit.

....



.... 2 marks

Exam model 4  Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 **The term electron was not known at the time of formulating ....**

ⓐ Rutherford's atomic model.
ⓑ Bohr's atomic model.
ⓒ Thomson's atomic model.
ⓓ Bohr's modified atomic model.

2 **If the principal quantum number of the last electron in the atom of a noble gas is (n = 3).**
What is the number of the orbitals which are completely filled with electrons in this atom ?

ⓐ 3 ⓑ 5 ⓒ 7 ⓓ 9

3 **What is the number of the unpaired (single) electrons in the atom of phosphorus $_{15}P$?**

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

4 **Bromine is similar to chlorine in all the following, except that ....**

ⓐ they are located in the same block in the periodic table.
ⓑ they have the same oxidation numbers.
ⓒ they are located in the same group.
ⓓ they are located in the same period.

5 **What is (are) the type(s) of the two elements whose ions form iron (II) sulphide ?**

ⓐ Main transition metal and representative nonmetal.
ⓑ Representative metal and representative nonmetal.
ⓒ Inner transition metal and metalloid.
ⓓ Both are representative metals.

6 **What is the correct descending order of the electron affinities of carbon, oxygen , fluorine and chlorine ?**

ⓐ Cl > F > O > C
ⓑ O > C > F > Cl
ⓒ F > C > O > Cl
ⓓ C > O > Cl > F

7 **Which of the following pairs of atomic numbers belongs to two elements which are located in the same block and the same period in the modern periodic table ?**

ⓐ 41 , 74 ⓑ 8 , 36 ⓒ 64 , 68 ⓓ 12 , 72

8 Which of the following electronic configurations belongs to an atom of an element which the difference between its third and second ionization potentials is very high ?

ⓐ $1s^2, 2s^2, 2p^6, 3s^1$ ⓑ $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$

ⓒ $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$ ⓓ $1s^2, 2s^2, 2p^6, 3s^2$

9 When MnO_4^- is converted to Mn^{2+}, this is described as ....

ⓐ a reduction process, because the oxidation number of Mn increases.

ⓑ an oxidation process, because the oxidation number of Mn increases.

ⓒ a reduction process, because the oxidation number of Mn decreases.

ⓓ an oxidation process, because the oxidation number of Mn decreases.

10 Which of the following oxides is the most basic oxide ?

ⓐ Al_2O_3 ⓑ K_2O ⓒ CO_2 ⓓ MgO

11 When (n = 6), then the correct sequence of filling the sublevels with electrons is ....

ⓐ $ns \longrightarrow (n-2)f \longrightarrow (n-1)d \longrightarrow np$

ⓑ $ns \longrightarrow (n-1)d \longrightarrow (n-2)f \longrightarrow np$

ⓒ $ns \longrightarrow (n-2)f \longrightarrow np \longrightarrow (n-1)d$

ⓓ $ns \longrightarrow np \longrightarrow (n-1)d \longrightarrow (n-2)f$

12 Which of the following can not be explained by Dalton's model of the atom ?

ⓐ The law of constant proportion.

ⓑ The difference between the element and the compound.

ⓒ The difference between the isotopes of the same element.

ⓓ The difference in the atomic masses of the elements.

13 When the last electron in sodium atom is excited to the energy level (n = 5), it ....

ⓐ remains in the energy level (n = 5).

ⓑ returns to the energy level (n = 3) in one jump.

ⓒ returns to the energy level (n = 4) then to (n = 2).

ⓓ returns to the energy level (n = 2).

14 Each of the following sets of quantum numbers is possible, except ....

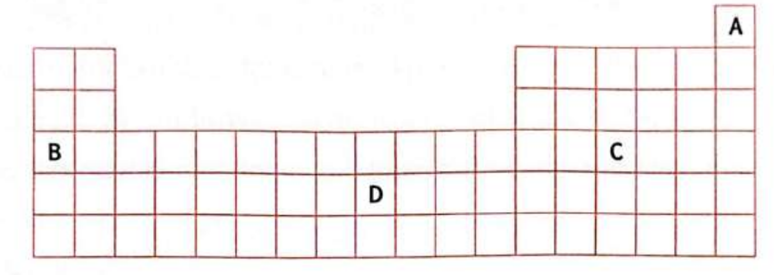
Choices	(n)	(l)	(m_l)	(m_s)
ⓐ	3	1	–1	0
ⓑ	3	2	+2	$-\frac{1}{2}$
ⓒ	4	3	+2	$-\frac{1}{2}$
ⓓ	5	3	+2	$+\frac{1}{2}$

15 What is the correct electron configuration of magnesium ion Mg^{2+} in the excited state ?

ⓐ $1s^2, 2s^2, 2p^5, 3s^2$ ⓑ $1s^2, 2s^2, 2p^6, 3s^1$

ⓒ $1s^2, 2s^2, 2p^6$ ⓓ $1s^2, 2s^2, 2p^5, 3s^1$

16 The following table represents a section in the periodic table :



Which of the following describes one of these elements ?

ⓐ Element A ends with the electronic configuration : ns^2, np^6

ⓑ Element B has more than one oxidation number.

ⓒ Element C is a metalloid.

ⓓ Element D is an inner transition element.

17 Each of the following describes the element $_{17}M$, except that ....

ⓐ it is an electronegative nonmetal.

ⓑ it forms M^+ which contains 4 unpaired electrons.

ⓒ its oxidation numbers range between –1 to +7

ⓓ it forms acidic oxides such as : M_2O_3 and M_2O_5

18 What is the atomic number of the element which is located in the sixth period in the periodic table and it is an alkali earth metal ?

ⓐ 56 ⓑ 55

ⓒ 87 ⓓ 88

19 The opposite table shows the types of the oxides of four elements which belong to the same group. What is the letter which refers to the element with the lowest electronegativity ?

Element	Type of its oxide
P	Acidic
Q	Amphoteric
R	Amphoteric
S	Basic

ⓐ R ⓑ Q

ⓒ P ⓓ S

20 **Among the oxygenated acids are :** HBrO , $HBrO_2$, $HBrO_3$

Which of the following expresses one of these acids ?

ⓐ HBrO is the weakest acid among these three acids.

ⓑ Oxidation number of bromine in $HBrO_3$ equals (–1).

ⓒ $HBrO_2$ is the strongest acid among these three acids.

ⓓ The ratio (n : m) in HBrO equals (1 : 1).

21 **In the reaction :** $Sb_2O_3 + 6H^+ + 6e^- \longrightarrow 2Sb + 3H_2O$

What is the change in the oxidation number of Sb ?

ⓐ It increases by 3 ⓑ It decreases by 3

ⓒ It increases by 6 ⓓ It decreases by 6

22 **The opposite table shows** the ionization potentials (first to fifth) of one of the elements of the third period in the modern periodic table.
Deduce the electron configuration of this element **and calculate its atomic number.**

Ionization potential (kJ/mol)				
First	Second	Third	Fourth	Fifth
+577.9	+1820	+2750	+11600	+14800

....

....

.... 1 mark

23 The last electron in the atom of an element has the quantum numbers :

$$(n = 3 , \ell = 1 , m_\ell = -1 , m_s = -\frac{1}{2})$$

Determine the location of this element in the periodic table.

....

....



24 **Illustrate the electronic configuration to the nearest noble gas of** a representative element which is located in the 4^{th} period, group 5A

....



25 **The following figure represents the first four periods in the modern periodic table.**

H																	
Li												B	C		O	F	
Na	Mg											Al		P	S	Cl	Ar
	Ca			V			Fe			Cu	Zn						

Answer the following :

(1) **What** is the number of the unpaired electrons in the ion of Mg ?

....

(2) **Circle the two elements** which combine together to form a compound that glows when an α-particle collide with it.

State the name of this compound.

....



26 If you know that the bond length in ammonia molecule NH_3 equals 1 Å, and in hydrogen molecule H_2 equals 0.6 Å, while in water molecule H_2O equals 0.96 Å

Calculate the bond length in NO molecule.

....

....

....

....

....

....

....

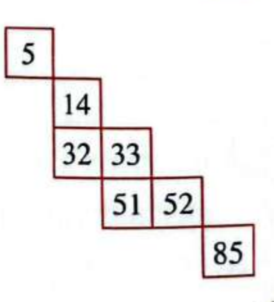
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27 **The opposite figure shows a section in the periodic table :**



(1) **What** do these numbers refer to ?

....

(2) **What** is the common feature in these elements ?

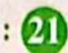
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Exam model 5  Open Book

Answered

- Choose the correct answer for the questions  : 

1 Number of electrons present in the orbitals of each of *s* and *p* sublevels is the same in the atom of ....

ⓐ $_{7}N$ ⓑ $_{11}Na$

ⓒ $_{12}Mg$ ⓓ $_{14}Si$

2 The following are some postulates of the theories which explain the atomic structure :

- Theory (A) : The electronic shells surround the nucleus which is in the center of the atom.
- Theory (B) : The atom is invisible solid sphere.
- Theory (C) : The atom contains vast space.

What is the historical order of these three theories ?

ⓐ A ⟶ B ⟶ C ⓑ B ⟶ C ⟶ A

ⓒ A ⟶ C ⟶ B ⓓ B ⟶ A ⟶ C

3 The ratio between the size of the cation to that of the anion is maximum in ....

ⓐ CsI ⓑ CsF

ⓒ LiF ⓓ NaF

4 All the following combinations of the quantum numbers are not allowed, except ....

ⓐ $n = 2, l = 2, m_l = +1$ ⓑ $n = 2, l = -1, m_l = 0$

ⓒ $n = 3, l = 2, m_l = +3$ ⓓ $n = 4, l = 3, m_l = -2$

5 Which of the following electron configurations does not verify both Hund's rule and the exclusion principle together ?

ⓐ [↑↓] [↑↑ | ↑ |] ⓑ [↑↓] [↑↓ | | ↑↓]

ⓒ [↑↓] [↓ | ↓ | ↓] ⓓ [↑↓] [↑↓ | ↑↓ | ↑]

6 In the opposite table.

What does (X) represent ?

ⓐ Ionization potential.

ⓑ Electronegativity.

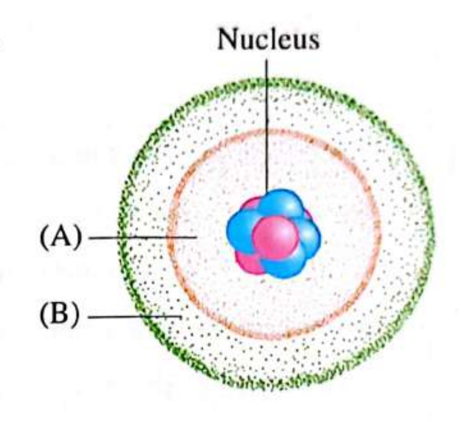
ⓒ Effective nuclear charge.

ⓓ Electron affinity.

Element	Li	Be	B	C	N	O	F
Atomic number	3	4	5	6	7	8	9
(X) values	1.28	1.91	2.42	3.14	3.83	4.45	5.10

7 The opposite figure represents an atom of an element.

Which of the following represents (A) and (B) ?



Choices	(A)	(B)
ⓐ	Orbital	Orbital
ⓑ	Electron cloud	Electron cloud
ⓒ	Electron cloud	Orbital
ⓓ	Orbital	Electron cloud

8 What is the correct order which represents the numbers of the single (unpaired) electrons in the ions of these transition elements ?

ⓐ $Cu^{2+} > Ni^{2+} > Cr^{3+} > Fe^{3+}$

ⓑ $Cr^{3+} > Fe^{2+} > Ni^{2+} > Cu^{2+}$

ⓒ $Fe^{3+} > Cr^{3+} > Cu^{2+} > Ni^{2+}$

ⓓ $Fe^{3+} > Cr^{3+} > Ni^{2+} > Cu^{2+}$

9 Three acids which are : $HClO$, $HBrO_4$, HIO_3

Which choice represents a similarity and a difference between these acids ?

Choices	The similarity	The difference
ⓐ	Oxidation number of the central atom	Oxidation number of O atom
ⓑ	Their strengths as oxygenated acids	Their hydroxy formula
ⓒ	Oxidation number of the central atom	Number of oxygen atoms nonbinded to hydrogen
ⓓ	Oxygenated halogen acids	Their strengths as oxygenated acids

10 Which of the following represents the number of the natural noble gases in the periodic table ?

Choices	In the same period	In group zero	In p-block	In the periodic table
(a)	1	6	0	6
(b)	1	6	6	6
(c)	0	5	6	5
(d)	6	6	0	5

11 What are the two elements which have almost the same ionization potential ?

(a) $_{13}Al$, $_{31}Ga$ (b) $_{38}Sr$, $_{31}Ga$

(c) $_{31}Ga$, $_{87}Fr$ (d) $_{87}Fr$, $_{13}Al$

12 The periodic table includes the known elements arranged according to their ....(1).........., in the group (1A) the metallic property ....(2).......... from the top to the bottom, and in the group (7A) the electronegativity ....(3).......... from the bottom to the top.

Which of the following choices represents the numbers (1), (2) and (3) in the previous statement ?

Choices	(1)	(2)	(3)
(a)	atomic numbers	increases	decreases
(b)	atomic numbers	increases	increases
(c)	mass numbers	decreases	increases
(d)	mass numbers	increases	decreases

13 Chlorine has an oxidation number +5 in ....

(a) $NaClO$ (b) $NaClO_2$

(c) $NaClO_3$ (d) $NaClO_4$

14 How many unpaired electrons does a ground state $_{24}Cr^{2+}$ ion have ?

(a) 0 (b) 2

(c) 4 (d) 6

15 **Which of the following expresses an element in the periodic table ?**

ⓐ The element whose atomic number is 48 is located in group (IIB), fifth period.

ⓑ The element whose electronic configuration is [Xe], $4f^{14}$, $5d^{3}$, $6s^{2}$ is located in group (IIIB), sixth period.

ⓒ The element whose electronic configuration is [Rn], $6d^{2}$, $7s^{2}$ is located in group (VB), seventh period.

ⓓ The element whose atomic number is 56 is located in group (IIIA), sixth period.

16 **An ion which contains 18 electrons and its charge is +2 , ...**

ⓐ its nucleus contains 18 protons.

ⓑ has the symbol Ar^{2+}

ⓒ has 18 neutrons.

ⓓ has the same electronic configuration of argon.

17 **The fourth period in the modern periodic table contains ....**

ⓐ 10 metals.

ⓑ 32 elements.

ⓒ one of the metalloids.

ⓓ number of transition elements greater than the total number of the elements of s and p-blocks.

18 **The opposite table shows the quantum numbers of the last electron which has the highest energy in the atom of an element.**

Quantum numbers	(n)	(ℓ)	(m_ℓ)	(m_s)
Last electron	3	2	+2	$-\frac{1}{2}$

What is the type of the oxide of this element ?

ⓐ Acidic. ⓑ Basic. ⓒ Neutral. ⓓ Amphoteric.

19 **All the following statements are correct, except ....**

ⓐ the wave mechanical theory of the atom is currently the accepted atomic model.

ⓑ the electron moves away from the nucleus upon being excited.

ⓒ according to Dalton's atomic model, the elements can combine chemically to form the compounds.

ⓓ Rutherford's experiment is the first to discover the presence of the negatively charged electrons in the atom.

20 **The element whose electron configuration : [Xe], $4f^{13}$, $6s^2$ belongs to** ....

ⓐ the third main transition series. ⓑ lanthanides.

ⓒ the second main transition series. ⓓ actinides.

21 **Which of the following quantum numbers represent one of the electrons of the partially occupied orbitals in the atom of vanadium $_{23}V$?**

Choices	n	l	m_l	m_s
ⓐ	3	1	0	$-\frac{1}{2}$
ⓑ	3	2	0	$+\frac{1}{2}$
ⓒ	4	1	0	$+\frac{1}{2}$
ⓓ	5	2	+1	$-\frac{1}{2}$

22 **The opposite table represents** the values of the electron affinities of the halogens.
Fill in the spaces with two suitable values of the following three values :

– 324.5 , – 400 , – 295

Element	Electron affinity
Fluorine	– 328 kJ/mol
Chlorine	– 348.6 kJ/mol
Bromine	.... kJ/mol
Iodine	.... kJ/mol

.... 1 mark

23 **Deduce the relation** which is illustrated by the opposite diagram.



....

....

....

.... 1 mark

24 **The opposite figure represents one of the postulates of a theory you have studied :**

(1) **What** is this theory ?

....

(2) **State** the postulate illustrated in the figure.

....

Lead atom

Two chlorine atoms → Lead (II) chloride

.... 2 marks

25 Rubidium Rb is one of the alkali metals.

Write the symbolic balanced equation which represents the reaction of rubidium oxide with water.

....





An element contains one electron in the last sublevel, if the quantum numbers of that electron are : $(n = 3 , \ell = 1 , m_\ell = -1 , m_s = +\frac{1}{2})$

(1) **Calculate** the atomic number of the element.

....

....

(2) **Mention** the number of the group in which the element is located.

....





If you know that :

- (O – H) bond length in water molecule equals 0.96 Å
- Bond length in oxygen molecule equals 1.32 Å

Calculate the bond length in hydrogen molecule.

....

....

....

....

....

....



Exam model 6  Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 What is the block of the element whose electronic configuration is [Kr] , $4d^{10}$, $4f^{4}$, $5s^{2}$, $5p^{6}$, $6s^{2}$?

ⓐ s-block. ⓑ p-block. ⓒ d-block. ⓓ f-block.

2 The opposite table shows the first three ionization potentials E_1 , E_2 and E_3 of an element. What is the most stable oxidation state of this element ?

E_1	E_2	E_3
7 eV	12.5 eV	42.5 eV

ⓐ +1 ⓑ +2 ⓒ +3 ⓓ +4

3 Which of the following valence electrons are affected by the highest effective nuclear charge ?

ⓐ $4s^1$ ⓑ $4p^1$ ⓒ $3d^1$ ⓓ $2p^3$

4 Four elements P , Q , R and S are located in p-block in the third period in the periodic table, they are ordered according to electronegativity as follows : S > R > Q > P

Which of the following compounds liberates H^+ ion easier ?

ⓐ P – O – H ⓑ S – O – H ⓒ Q – O – H ⓓ R – O – H

5 Iron (II) chloride reacts with chlorine as follows :

$$2FeCl_2 + Cl_2 \longrightarrow 2FeCl_3$$

Which of the following statements is correct ?

ⓐ Fe^{2+} ions are reduced to Fe^{3+} ions and chlorine acts as oxidizing agent.

ⓑ Fe^{2+} ions lose electrons and chlorine acts as reducing agent.

ⓒ Fe^{2+} ions lose electrons and Cl_2 molecules are reduced to Cl^- ions.

ⓓ Cl_2 molecules are reduced to Cl^- ions and chlorine acts as reducing agent.

6 What is the symbol of the element which is located in group (3A), fifth period in the periodic table ?

ⓐ $_{13}Al$ ⓑ $_{22}Ti$ ⓒ $_{41}Nb$ ⓓ $_{49}In$

7. An electron with the quantum numbers :

$$(n = 4, \ell = 1, m_\ell = -1, m_s = +\frac{1}{2}).$$

What is the sublevel of this electron ?

(a) *4s* (b) *4p* (c) *4d* (d) *4f*

8. What are the two elements which are located in the same period in the periodic table ?

(a) Mg , Sb (b) Ca , Zn

(c) Na , Ca (d) Ca , Cl

9. What is the proper graduation in electronegativity in these four shown elements ?

(a) C < N < Si < P (b) Si < P < C < N

(c) N < C < P < Si (d) C < Si < N < P

10. The opposite table shows the first and second ionization potentials of four elements : P , Q , R and S. What is the most active metal in this group of elements ?

Element	First ionization potential	Second ionization potential
S	2372 kJ/mol	5251 kJ/mol
R	520 kJ/mol	7300 kJ/mol
Q	900 kJ/mol	1760 kJ/mol
P	1680 kJ/mol	3380 kJ/mol

(a) S (b) P

(c) R (d) Q

11. What is the number of elements in the fourth period in the periodic table, in which the orbitals of *3d* sublevel are occupied by one electron or more ?

(a) 16 (b) 10 (c) 9 (d) 0

12. Which of the following electronic transitions in hydrogen atom is accompanied by maximum release of energy ?

(a) (n = 2) ⟶ (n = 1). (b) (n = 3) ⟶ (n = 2).

(c) (n = 4) ⟶ (n = 3). (d) (n = 2) ⟶ (n = 4).

13. The maximum value of (m_ℓ) for an electron in the fourth energy level is ....

(a) +3 (b) +4 (c) +5 (d) +9

14. Nitrogen has atomic number 7 and oxygen has atomic number 8

What is total number of electrons in $(NO_3)^-$ ion ?

(a) $15e^-$ (b) $31e^-$

(c) $32e^-$ (d) $46e^-$

15 **The electron configuration $1s^2, 2s^2, 2p^5, 3s^1$ shows ....**

ⓐ the ground state of fluorine.

ⓑ an excited state of fluorine.

ⓒ an excited state of neon.

ⓓ the ground state of O^{2-} ion.

16 **Bohr's model could explain successfully the spectrum of ....**

ⓐ the multi-electron atoms.

ⓑ helium.

ⓒ any atom or ion containing only one electron.

ⓓ hydrogen molecule.

17 **According to Hund's rule and Pauli's exclusion principle, the two last electrons which have the highest energy in the atom of $_{26}Fe$ element are different in the two quantum numbers ....**

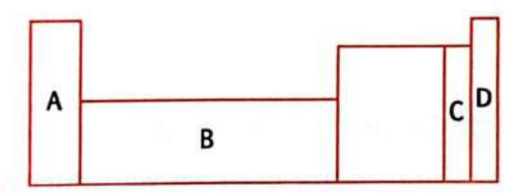
ⓐ l, m_l

ⓑ n, m_l

ⓒ l, m_s

ⓓ m_l, m_s

18 **The opposite figure represents a section in the periodic table. In which of the illustrated areas a diatomic molecule element which does not conduct electricity is found ?**



ⓐ A

ⓑ B

ⓒ C

ⓓ D

19 **Cathode rays are deflected away from the negatively charged metal plate, because they are ....**

ⓐ non-material particles.

ⓑ negatively charged.

ⓒ emitted from all materials.

ⓓ positively charged.

20 **Which of the following is the electron configuration of iron cation in $Fe(OH)_2$?**

(knowing that the atomic number of iron = 26)

ⓐ $[Ar], 4s^2, 3d^6$

ⓑ $[Ar], 4s^2, 3d^4$

ⓒ $[Ar], 4s^0, 3d^6$

ⓓ $[Ar], 4s^2, 3d^8$



21 **Which transformation is an oxidation ?**

ⓐ $VO_3^- \longrightarrow VO_2^+$ ⓑ $CrO_2^- \longrightarrow CrO_4^{2-}$

ⓒ $SO_3 \longrightarrow SO_4^{2-}$ ⓓ $NO_3^- \longrightarrow NO_2^-$

22 **The opposite table shows** the values of the quantum numbers of the last electron in the atom of the element (X).

Quantum numbers	(n)	(ℓ)	(m_ℓ)	(m_s)
Element (X)	4	1	0	$+\frac{1}{2}$

Deduce the four quantum numbers of the last electron in the atom of element (Y) which follows element (X) in the same group in the periodic table.

....



23 **Write the four quantum numbers of** the electron number 11 in each of sodium and magnesium atoms.

....

....



24 Figure (1) shows the falling apples and their distribution around the trunk of their tree in circles with different radii :



Figure (1)

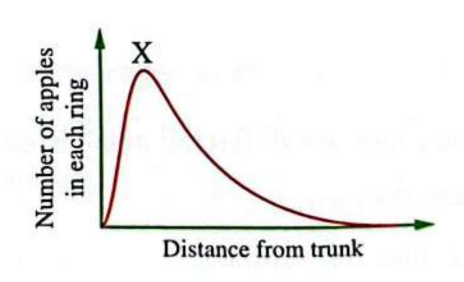


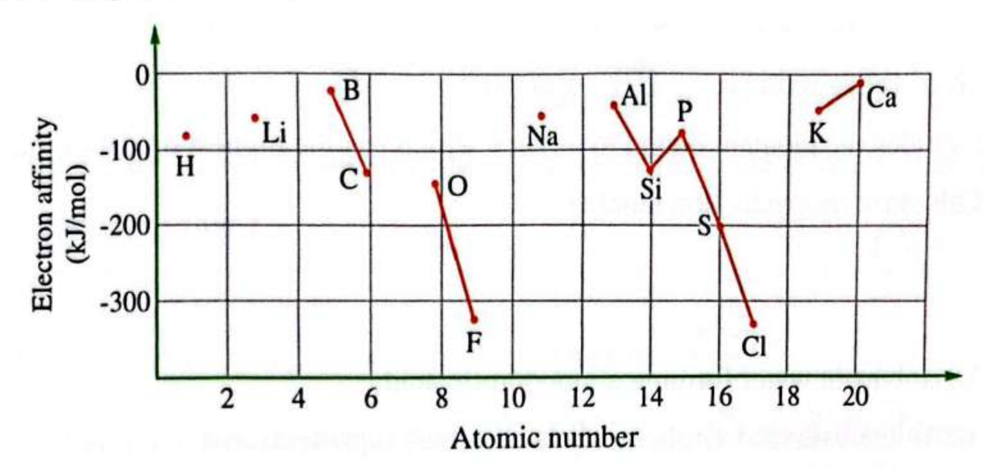
Figure (2)

In the light of understanding the different atomic theories.
What does the symbol (X) in the figure (2) represent ?

....

....
1 mark

25 **The following graph represents** the values of the electron affinity of the first twenty elements in the periodic table :



Why were the symbols [He , Be , N , Ne , Mg , Ar] **neglected to be mentioned in this graph ?**

....

....

....

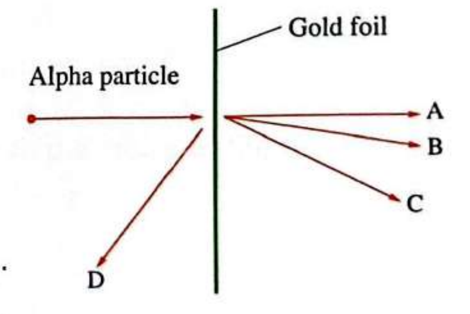
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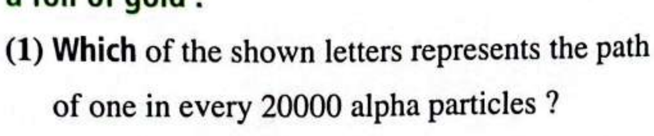
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.... 2 marks

26 **The opposite figure shows the different paths of alpha particles, when a beam of them hits a foil of gold :**





(1) **Which** of the shown letters represents the path of one in every 20000 alpha particles ?

....

....

(2) **What** can be deduced from this observation ?

....

....

....


.... 2 marks

27 Here are five different oxides of different elements :

Na_2O , MgO , Al_2O_3 , SO_2 , Cl_2O

Which of these oxides :

(1) Includes the element bound to oxygen which has the highest oxidation number ?

Calculate this oxidation number.

....

....

(2) Dissolves in water forming a monoprotic acid,

write the balanced symbolic equation which represents this.

....

....

.... / 2 marks

Exam model 7



Open Book



Answered

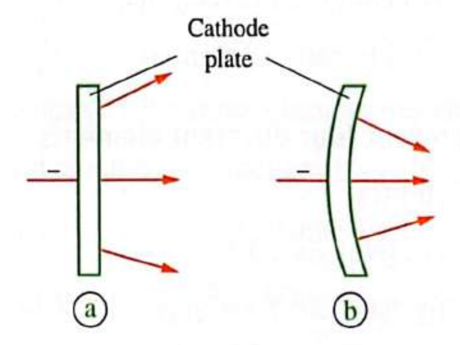
Choose the correct answer for the questions 1 : 21

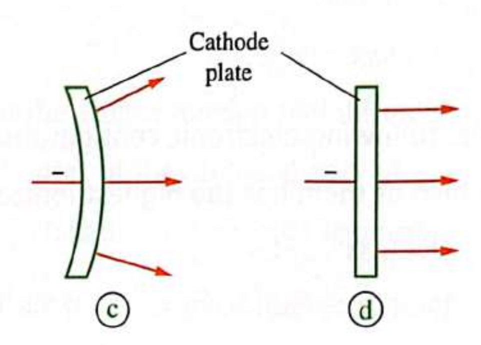
1 **Which of the following electronic configurations represents the element that is the most electropositive ?**

ⓐ [He], $2s^1$ ⓑ [Ne], $3s^2$

ⓒ [Xe], $6s^1$ ⓓ [Xe], $6s^2$

2 **Each of the following figures shows the path of the cathode rays emitted from the surface of the cathode plate, except ....**





3 **The element with the least atomic number that has the stable electronic configuration : $(n-1)d^6$, ns^2 is located in the ....**

ⓐ sixth period. ⓑ fifth period.

ⓒ fourth period. ⓓ third period.

4 **If the radius of the first orbital in H atom equals x Å, so the radius of the second orbital in Li^{2+} ion is ....**

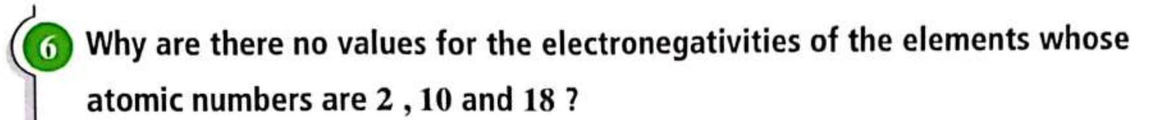
ⓐ x Å ⓑ $\frac{4}{3}x$ Å

ⓒ $\frac{9}{2}x$ Å ⓓ $4x$ Å

5 **Which of the following transfers of the electron of hydrogen atom is accompanied by releasing the largest amount of energy ?**

ⓐ $n = 4 \longrightarrow n = 2$ ⓑ $n = 5 \longrightarrow n = 2$

ⓒ $n = 2 \longrightarrow n = 1$ ⓓ $n = 7 \longrightarrow n = 2$



6 **Why are there no values for the electronegativities of the elements whose atomic numbers are 2 , 10 and 18 ?**

ⓐ Because they are gaseous substances.

ⓑ Because they are amphoteric.

ⓒ Because they are radioactive.

ⓓ Because their electronic configurations are stable.

7 **What is the number of orbitals in the level (n = 3) ?**

ⓐ 3 ⓑ 5

ⓒ 7 ⓓ 9

8 **What is the similarity between the metal atom M and its ion M^{3+} ?**

ⓐ The radius. ⓑ Number of electrons.

ⓒ Nuclear charge. ⓓ Ionization potential.

9 **The following electronic configurations represent four different elements. Which of them has the highest ionization potential ?**

ⓐ [Ne], $3s^2, 3p^1$ ⓑ [Ne], $3s^2, 3p^3$

ⓒ [Ne], $3s^2, 3p^4$ ⓓ [Ar], $3d^{10}, 4s^2, 4p^3$

10 **Which of the following equations represents an oxidation-reduction reaction ?**

ⓐ $CaCl_2 + Na_2SO_4 \longrightarrow CaSO_4 + 2NaCl$

ⓑ $KOH + HNO_3 \longrightarrow KNO_3 + H_2O$

ⓒ $N_2 + O_2 \longrightarrow 2NO$

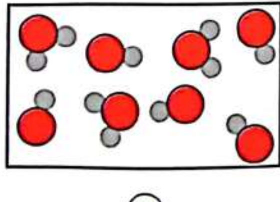
ⓓ $AgNO_3 + NaCl \longrightarrow NaNO_3 + AgCl$

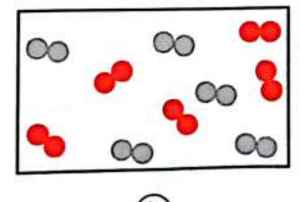
11 **Which of the following choices is incompatible with the building-up principle ?**

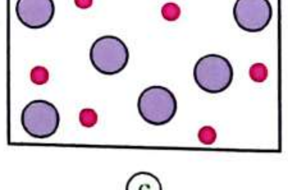
ⓐ [↑↓] [↑↑ | ↑ | ↑] ⓑ [↑↓] [↑ | ↑ | ↑]

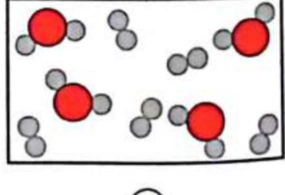
ⓒ [↑] [↑↓ | ↑ | ↑] ⓓ [↑↓] [↑↓ | ↑↓ | ↑]

12 **Which of the following represents a mixture of two of group zero elements ?**


ⓐ


ⓑ


ⓒ


ⓓ

13 Which of the following electron configurations includes two unpaired (single) electrons ?

ⓐ $1s^2, 2s^2$ ⓑ $1s^2, 2s^2, 2p^3$

ⓒ $1s^2, 2s^2, 2p^4$ ⓓ $1s^2, 2s^2, 2p^5$

14 Which of the following processes represents the formation of a strong acid as a result of an oxidation process ?

ⓐ $H_2SO_3 \longrightarrow H_2S$ ⓑ $HClO_4 \longrightarrow HCl$

ⓒ $H_2SO_3 \longrightarrow H_2SO_4$ ⓓ $HCO_3^- \longrightarrow H_2CO_3$

15 Which of the following elements atoms releases the highest amount of energy when it gains an electron in its gaseous state ?

ⓐ C ⓑ O ⓒ Si ⓓ S

16 The isotopes of the same element are similar in the atomic number and different in the mass number, this fact contradicts the postulates of the atomic theory of ....

ⓐ Bohr. ⓑ Rutherford. ⓒ Dalton. ⓓ Thomson.

17 Which of the following cases represents the transfer of an excited electron back to its ground energy level ?

ⓐ $1s^2, 2s^2, 2p^5 \longrightarrow 1s^2, 2s^2, 2p^4, 3s^1$

ⓑ $1s^2, 2s^2, 2p^6, 4s^1 \longrightarrow 1s^2, 2s^2, 2p^6, 3s^1$

ⓒ $[Ar], 4s^2 \longrightarrow [Ne], 3s^2$

ⓓ $2, 8, 7 \longrightarrow [Ne], 3s^2, 3p^5$

18 The history of proving the presence of a nucleus inside the atom of the element goes back to after ....

ⓐ Bohr. ⓑ Thomson. ⓒ Rutherford. ⓓ Heisenberg.

19 Which of the following supports the dual nature of the electrons ?

ⓐ The emission spectrum of hydrogen atom.

ⓑ The deflection of some α-particles on collision with gold foil.

ⓒ The penetration of some α-particles on collision with gold foil.

ⓓ The properties of the cathode rays.

20 **Which of the following choices represents an impossible combination of quantum numbers ?**

Choices	(n)	(ℓ)	(m_ℓ)	(m_s)
ⓐ	3	2	+2	$-\frac{1}{2}$
ⓑ	3	1	−1	$+\frac{1}{2}$
ⓒ	4	3	+2	$+\frac{1}{2}$
ⓓ	5	2	+3	$-\frac{1}{2}$

21 **Each of the following matches Pauli's principle, except** ....

ⓐ [↑↓] [↑↓][ ][ ]

ⓑ [↑↑] [↑][↑][↑]

ⓒ [↑↓] [↑][↓][↑]

ⓓ [↑] [↑][↑][↑]

22 **What is the difference between the oxidation numbers of potassium** in potassium permanganate compound **and** in potassium dichromate compound ? **Explain.**

....

....

....

.... 1 mark

23 **What is the maximum number** of electrons can be found in an atom and have the following quantum numbers :

$$(n = 1 , \ell = 0 , m_\ell = 0)$$

....

.... 1 mark

24 **Do the values in the following table agree** with the graduation of the property of ionization potential in the periodic table ? **Explain.**

The element	First ionization potential
Phosphorus $_{15}P$	+1012 kJ/mol
Sulphur $_{16}S$	+1000 kJ/mol

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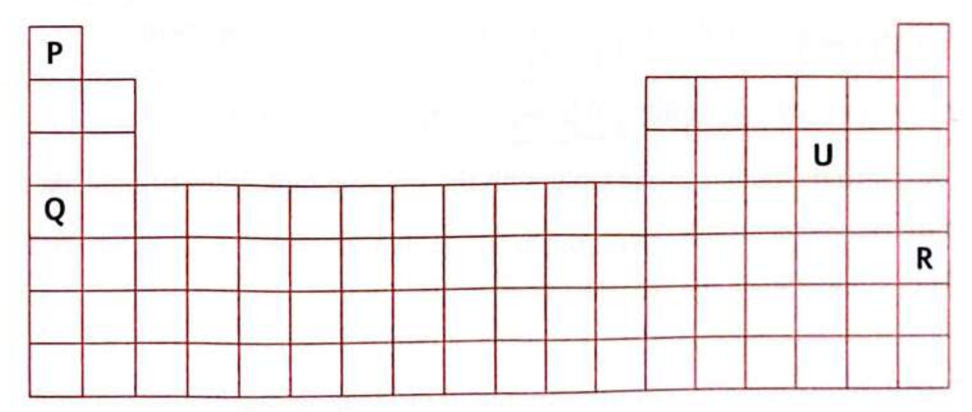
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25 **The following figure represents** a section in the periodic table.



Write the letter that indicates the element which conducts the electricity better than silicon, **and mention its block in the periodic table.**

....

....

1 mark



26 **The following diagram illustrates the reaction of an alkali with an acidic oxide to form a salt that dissolves in water :**

2 KOH	+	......(1)	⟶	......(2)	+	......(3) ......
Alkali		Acidic oxide		Water		Salt

(1) **Complete** the previous diagram with chemical formulas that fulfill a correct balanced symbolic chemical equation.

(1) : .... **(2) :** ....

(3) : ....

(2) **Deduce** the values of (n) and (m) of the oxygenated acid which is produced from dissolving the acidic oxide – in the chemical equation – in water.

....

....

....

....

....

.... 2 marks

27 **The following table illustrates the values of the covalent atomic radii of the molecules of some elements :**

The molecule	H – H	......(1)......	......(2)......	......(3)......	......(4)......
The covalent atomic radius	0.3 Å	0.99 Å	1.33 Å	1.14 Å	0.64 Å

(1) **Complete** the blanks in the table with the suitable molecules of the first four elements in the halogens group.

(1) : .... **(2) :** ....

(3) : .... **(4) :** ....

(2) **Calculate** the bond length in hydrogen chloride molecule.

....

....

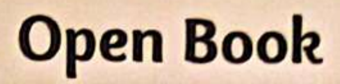
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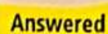
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Exam model 8





Choose the correct answer for the questions 1 : 21

1 The visible spectrum of hydrogen atom shows ....

ⓐ the presence of sublevels in each principal level.

ⓑ the presence of definite energy levels.

ⓒ the possibility of the emission of a quantum from the orbital of $1s$

ⓓ the presence of different isotopes of hydrogen atom.

2 The electronic configuration of the element (X) ends with the sublevels :

$(n-1)s^2$, $(n-1)p^6$, $(n-1)d^5$, ns^2

If (n = 4) , then the atomic number of (X) = ...

ⓐ 15 ⓑ 25

ⓒ 30 ⓓ 35

3 The element (X) is located in the third period, group (5A) and the element (Y) is in the fifth period, group (15).

What is the atomic number of the element which is located in between them ?

ⓐ 31 ⓑ 32

ⓒ 33 ⓓ 34

4 In which two compounds of the following the underlined element has the same oxidation number ?

ⓐ $\underline{Cr}SO_4$, $\underline{Cr}_2O_3$ ⓑ $Na\underline{Cl}O_3$, $Cu\underline{Cl}_2$

ⓒ $\underline{Mn}Cl_2$, $\underline{Mn}O_2$ ⓓ $\underline{S}O_3$, $H_2\underline{S}O_4$

5 All the following are among the conclusions of Rutherford's experiment, <u>except</u> that ....

ⓐ the atom contains vast space.

ⓑ the nucleus is so much smaller in size than the atom.

ⓒ most of the atomic mass is concentrated in the nucleus.

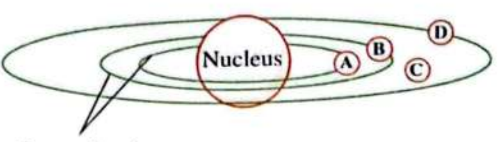
ⓓ the electrons revolve around the atom in definite orbitals.

6 The maximum number of electrons required to saturate a sublevel can be estimated from the relation ....

ⓐ $4\ell + 2$ ⓑ $2\ell + 1$

ⓒ $2n^2$ ⓓ $4\ell - 2$

7 **According to the wave mechanical theory, the letter (D) in the opposite figure represents ....**



ⓐ a fixed position of the electron.

ⓑ the farthest position from nucleus that an electron can reach.

ⓒ a probable position of an electron.

ⓓ an impossible position for an electron.

8 **Among the properties of the nonmetals is that they ....**

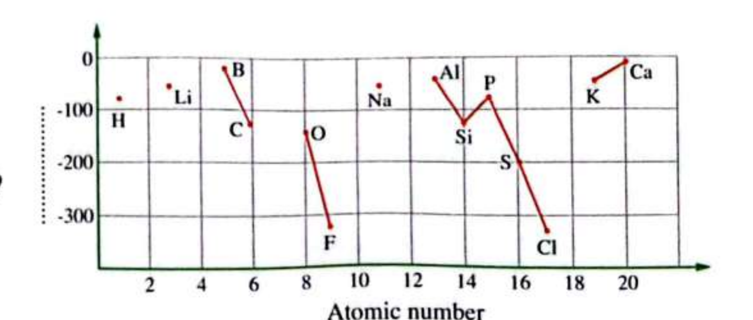
ⓐ are reducing agents.

ⓑ form oxides which react with acids.

ⓒ gain electrons forming cations.

ⓓ are electronegative elements.

9 **What is the property which is represented by the vertical axis of the opposite graph of the first 20 elements in the periodic table ?**



ⓐ Atomic radius.

ⓑ Electron affinity.

ⓒ Ionization potential.

ⓓ Electronegativity.

10 **The number of the electrons of the sublevel *d* in $_{26}Fe^{3+}$ ion equals ....**

ⓐ the number of the electrons of the sublevel *p* in $_{7}N$ atom.

ⓑ the number of the elements of the second period in the periodic table.

ⓒ the number of the sublevels in $_{27}Co^{3+}$ ion.

ⓓ the number of the electrons of the sublevel *p* in $_{8}O^{-}$ ion.

11 **Which of the following choices represents the correct ascending graduation in the atomic radius property ?**

Choices	Smaller radius ⟶ Larger radius		
ⓐ	Ca^{2+}	K^{+}	Ar
ⓑ	Ca^{2+}	Ar	K^{+}
ⓒ	Ar	K^{+}	Ca^{2+}
ⓓ	K^{+}	Ca^{2+}	Ar

12 Which of the following quantum numbers combinations belongs to an electron that is located in one of *4p* orbitals ?

ⓐ $n = 4, \ell = 1, m_\ell = 0, m_s = +\frac{1}{2}$

ⓑ $n = 4, \ell = 1, m_\ell = +3, m_s = -\frac{1}{2}$

ⓒ $n = 4, \ell = 2, m_\ell = 0, m_s = +\frac{1}{2}$

ⓓ $n = 4, \ell = 4, m_\ell = +3, m_s = -\frac{1}{2}$

13 What are the two elements in which electronegativity of the second element is higher than the electronegativity of the first element ?

Choices	First element	Second element
ⓐ	F	Fe
ⓑ	Br	Cl
ⓒ	Li	K
ⓓ	S	P

14 Number of electrons equals number of neutrons in ....

ⓐ $^{11}_{5}B$

ⓑ $^{23}_{11}Na^{+}$

ⓒ $^{24}_{12}Mg^{2+}$

ⓓ $^{19}_{9}F^{-}$

15 Which of these choices represents the electron configuration of boron element ?

Choices	*1s*	*2s*	$2p_x$	$2p_y$	$2p_z$
ⓐ	⇅	⇅	↑		
ⓑ	↑	⇅	↑	↑	
ⓒ	⇅	↑	↑		
ⓓ	⇅	↑↑	↑		

16 Each of the following reactions is an oxidation–reduction reaction, <u>except</u> ....

ⓐ $Cu + Br_2 \longrightarrow CuBr_2$

ⓑ $CO + H_2O \longrightarrow CO_2 + H_2$

ⓒ $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

ⓓ $RbOH + HCl \longrightarrow RbCl + H_2O$



17 **Each of the following oxides reacts with sodium hydroxide solution to form a salt, except** ....

ⓐ Al_2O_3

ⓑ P_2O_5

ⓒ MgO

ⓓ SiO_2

18 **The photon which is emitted from the electron of hydrogen atom when it transfers from *4d* to *2s* is in the form of** ....

ⓐ infrared ray.

ⓑ ultraviolet ray.

ⓒ visible ray.

ⓓ X–ray.

19 **Which of the following is correct for the properties of the cathode rays ?**

ⓐ They heat a thin metal sheet that stands in their way as they move in straight lines.

ⓑ They move a light ball of foam as they move in straight lines.

ⓒ They affected by the electrical field as they are material particles.

ⓓ They heat a thin metal sheet that stands in their way as they have thermal effect.

20 **Protactinium is one of the actinides and its electronic configuration is** ....

ⓐ $[Xe], 6s^2, 5d^0, 4f^6$

ⓑ $[Xe], 6s^2, 5d^3, 4f^{14}$

ⓒ $[Rn], 7s^2, 6d^1, 5f^2$

ⓓ $[Rn], 7s^2, 6d^4, 5f^{14}$

21 **What is the maximum number of electrons which have the spin quantum number ($m_s = +\frac{1}{2}$) in the sublevel ($\ell = 3$) ?**

ⓐ 3

ⓑ 5

ⓒ 6

ⓓ 7

22 **The opposite table shows** the first five ionization potentials of the element (X).

Ionization potential (kJ/mol)				
First	Second	Third	Fourth	Fifth
+738	+1450	+7733	+10543	+13630

Deduce the formula of the chloride of the element (X).

....

....

.... 1 mark

23 The reaction of acid with sodium carbonate salt is indicated by the evolution of CO_2 gas bubbles, so if two equal volumes of H_2SO_4 and H_2ClO_3 acids with similar concentrations are added to two similar masses of sodium carbonate.

Deduce the name of the acid which forms the higher number of bubbles in the beginning of the reaction, **with proving your answer with a scientific proof in the light of what you have studied.**

....

....

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.... 2 marks

24 **Calculate the difference in the number of the representative elements** between the first period **and** the second period in the modern periodic table.

....

....

....

....

....

.... 1 mark

25 **The following table illustrates some informations about the elements (X) , (Y) :**

	Element (X)	Element (Y)
Quantum numbers of the last electron in the element atom	$(n = 1, \ell = 0, m_\ell = 0, m_s = +\frac{1}{2})$	$(n = 2, \ell = 1, m_\ell = +1, m_s = +\frac{1}{2})$
Bond length in the element molecule	0.6 Å	1.4 Å
Electronic configuration of the element	.... (1)	.... (2) ....

(1) **Complete** the previous table with the electronic configurations of the elements (X) and (Y).

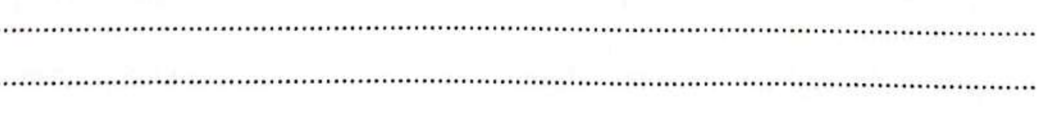
(2) **Predict** the bond length of the molecule of the element which precedes the element (Y) in the periodic table.

....



26 Two electrons in one element atom are located in the first orbital in the same *p* sublevel in the principal level L

Write the quantum numbers of the two electrons.



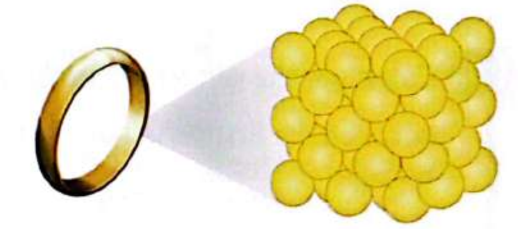
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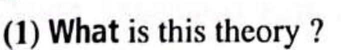
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27 **The opposite figure represents one of the postulates of an atomic theory that you have studied :**





(1) **What** is this theory ?

....

(2) **What** is the postulate which is represented in this figure ?

....

....

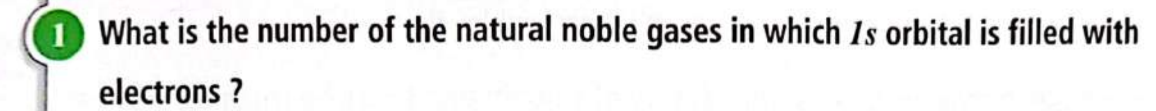




Exam model 9 Open Book



Answered



Choose the correct answer for the questions 1 : 21

1. What is the number of the natural noble gases in which *1s* orbital is filled with electrons ?

ⓐ 1 ⓑ 3 ⓒ 5 ⓓ 6

2. What is the reducing agent in the redox reaction which is represented by the following equation $12H^+_{(aq)} + 2IO^-_{3(aq)} + 10Fe^{2+}_{(aq)} \longrightarrow 10Fe^{3+}_{(aq)} + I_{2(s)} + 6H_2O_{(l)}$?

ⓐ I_2 ⓑ H^+ ⓒ Fe^{2+} ⓓ IO_3^-

3. A student represented the electron configuration of oxygen atom in its ground state as follows : $1s^2$, $2s^2$, [⇅ | ⇅ |] *2p*

This representation violates ....

ⓐ Hund's rule only.

ⓑ Aufbau principle only.

ⓒ Pauli's exclusion principle only.

ⓓ Hund's rule and Pauli's principle.

4. All the following sets of quantum numbers are possible, except ....

ⓐ $n = 4 , \ell = 3 , m_\ell = -2 , m_s = -\frac{1}{2}$

ⓑ $n = 5 , \ell = 3 , m_\ell = +2 , m_s = -\frac{1}{2}$

ⓒ $n = 3 , \ell = 2 , m_\ell = -1 , m_s = +\frac{1}{2}$

ⓓ $n = 1 , \ell = 1 , m_\ell = +1 , m_s = +\frac{1}{2}$

5. A sample of a compound formed by the combination of 2.69 g of hydrogen with 47.31 g of sulphur.

What is the mass of hydrogen in a sample of the same compound in which the mass of sulphur equals 75.63 g ?

ⓐ 2.69 g ⓑ 1.68 g

ⓒ 4.3 g ⓓ 203.4 g

6 The two ions $_{27}W^{2+}$ and $_{28}X^{3+}$ are similar in all the following, <u>except</u> ....

(a) the number of protons which exist in the nucleus of the atom.

(b) the number of electrons of the last principal level.

(c) the number of the sublevels which are occupied by electrons.

(d) the number of the unpaired electrons in the last sublevel.

7 The relation between the electron affinity of sulphur and that of oxygen resembles the relation between the electron affinity of chlorine and that of fluorine.
Which of these choices represents the correct descending graduation in electron affinity in nitrogen, oxygen and sulphur ?

(a) S > O > N

(b) O > S > N

(c) N > O > S

(d) S > N > O

8 Neutral oxides react neither with acids nor with bases.
Which of the following substances are neutral oxides ?

(a) NO_2 , Na_2O

(b) CO , NO

(c) SnO , K_2O

(d) CO_2 , NO_2

9 The element whose atomic number is 57 belongs to ....

(a) s-block.

(b) p-block.

(c) d-block.

(d) f-block.

10 The opposite table shows the quantum numbers (n), (ℓ) of 5 electrons in one atom.
What is the correct ascending order of the energies of these electrons ?

Electron	(I)	(II)	(III)	(IV)	(V)
(n)	3	5	4	4	4
(ℓ)	2	0	1	2	0

(a) I < V < III < IV < II

(b) I < V < III < II < IV

(c) V < I < III < II < IV

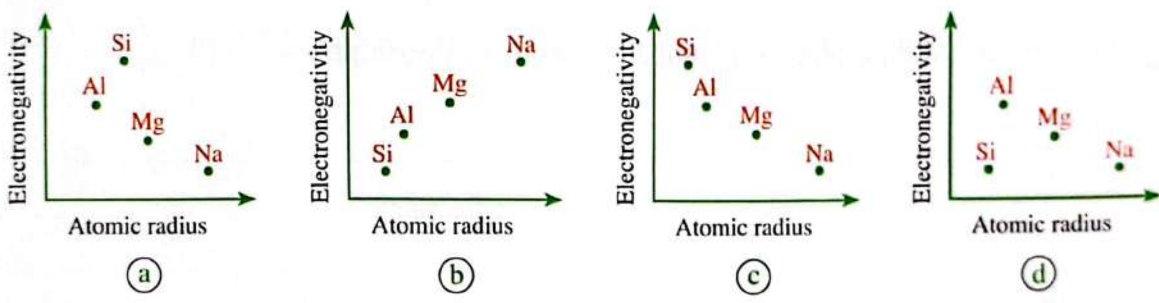
(d) V < I < II < III < IV

11 In the reaction : $OF_2 + SO_2 \longrightarrow SO_3 + F_2$

Which is being oxidized and which is reduced in this reaction ?

Choices	Fluorine	Oxygen in OF_2	Sulphur
(a)	Oxidized	Oxidized	Reduced
(b)	Oxidized	Reduced	Oxidized
(c)	Reduced	Oxidized	Reduced
(d)	Reduced	Reduced	Oxidized

12 Which of the following graphical figures represents the relation between electronegativity of (sodium, magnesium, aluminum and silicon) and their atomic radii ?



13 The concept of the atom as the smallest unit of matter was adopted by ....

(a) Democritus and Aristotle.
(b) Boyle and Aristotle.
(c) Democritus and Thomson.
(d) Bohr and Berzelius.

14 The line spectrum differs from an element to another due to ....

(a) the difference in the number of neutrons in each of them.
(b) the difference in the mass number of each of them.
(c) the difference in the electronic configuration of each of them.
(d) the difference in the number of valence electrons in each of them.

15 All the following match Bohr's atomic model, except ....

(a) the line spectrum of hydrogen atom.
(b) Pauli's principle.
(c) Planck's theory.
(d) Heisenberg's principle.

16 The oxide ion ${}^{16}_{8}O^{2-}$ contains ....

(a) 8 protons , 10 electrons.
(b) 10 protons , 8 electrons.
(c) 8 protons , 9 electrons.
(d) 10 protons , 7 electrons.

17 **The metal which is less active than potassium but more active than lithium and beryllium is ....**

ⓐ Na

ⓑ Ca

ⓒ B

ⓓ Fr

18 **All the following about the periodic table are correct, <u>except</u> ....**

ⓐ it consists of number of groups more than double the number of periods.

ⓑ the alkali elements differ in the principal quantum number (n).

ⓒ the energy sublevels are filled with electrons according to the uncertainty principle.

ⓓ Pauli's principle is applied to every element in the periodic table.

19 **What is the total number of valence electrons in thiosulphate ion $(S_2O_3)^{2-}$?**

ⓐ $28e^-$

ⓑ $30e^-$

ⓒ $32e^-$

ⓓ $34e^-$

20 **What are the two quantum numbers which represent the orbitals that are filled successively with electrons in the elements $_{21}Sc$ to $_{30}Zn$?**

ⓐ $(n = 3 , \ell = 1)$

ⓑ $(n = 3 , \ell = 2)$

ⓒ $(n = 4 , \ell = 1)$

ⓓ $(n = 4 , \ell = 2)$

21 **What is the number of the orbitals which are completely filled with electrons in the principal level (n = 3) of iodine atom $_{53}I$?**

ⓐ 9

ⓑ 10

ⓒ 11

ⓓ 12

22 **Determine the location of the element (X)** in the periodic table, knowing that the quantum numbers of its last electron are : ($n = 3$, $\ell = 1$, $m_\ell = -1$, $m_s = -\frac{1}{2}$)

.... 1 mark

23 **The following figure** represents a section in the modern periodic table :

X

Y

Z

Which of the elements X, Y and Z has the highest second potential energy ? **Explain.**

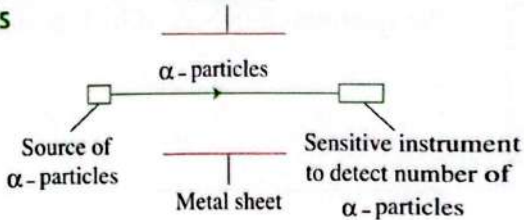
.... 2 marks

24 **Explain in the light of what you have studied,**

which is more acidic sulphuric acid H_2SO_4 **or** sulphurous acid H_2SO_3 ?

.... 2 marks

25 **The opposite figure represents the path of a beam of α-particles between two metal sheets in vacuum conditions :**



(1) **Illustrate** on the figure the path of the beam of α-particles if the upper metal sheet becomes negatively charged and the lower metal sheet becomes positively charged.

(2) **Predict** what will happen to the reading of the sensitive instrument after charging the two metal sheets with different charges.

....

.... 2 marks

26 Chlorine atomic radius equals 0.99 Å, the bond length in the molecule of ammonia equals 1 Å, and the bond length in the molecule of hydrogen chloride equals 1.29 Å

Calculate which is longer, the bond in hydrogen molecule **or** the bond in nitrogen molecule.

....

....

....

....

....


.... 1 mark



27 **The following series of elements is located in one of the modern periodic table periods :**

Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
$4s^2, 3d^1$	$4s^2, 3d^2$	$4s^2, 3d^3$	....	$4s^2, 3d^5$	$4s^2, 3d^6$	$4s^2, 3d^7$	$4s^2, 3d^8$	....	$4s^2, 3d^{10}$

Complete the blanks which are found below Cr, Cu elements with what is suitable for each of them.


.... 1 mark

Exam model 10  Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 **Which of the following represents the proper graduation in electron affinity ?**

ⓐ $O > C > N > B$ ⓑ $B > N > C > O$

ⓒ $O > C > B > N$ ⓓ $O > B > C > N$

2 **Breaking (M – O) bond in M – O – H indicates that ....**

ⓐ the difference in electronegativity between M and O is lower than that between O and H

ⓑ the compound is being ionized according to the reaction medium.

ⓒ the difference in electronegativity between M and O is higher than that between O and H

ⓓ the compound is being ionized as an acid.

3 **Bohr's atomic model can be applied to ....**

ⓐ Na^{10+} ion. ⓑ He atom.

ⓒ Be^{2+} ion. ⓓ C^{6+} ion.

4 **Which of the following conversions shows an oxidation and a reduction for the same element ?**

ⓐ $N_2 \longrightarrow NH_3 \longrightarrow NO$

ⓑ $C \longrightarrow CO \longrightarrow CO_2$

ⓒ $PbO_2 \longrightarrow PbO \longrightarrow Pb$

ⓓ $C_2H_2 \longrightarrow C_2H_4 \longrightarrow C_2H_6$

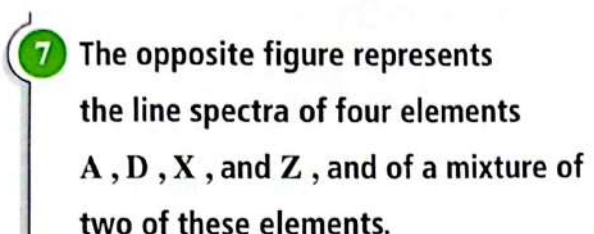
5 **What is the number of the orbitals which $(n + \ell)$ of its electrons is less than 5 ?**

ⓐ 4 ⓑ 8 ⓒ 9 ⓓ 10

6 **Which of these electron configurations is incompatible with both exclusion principle and Hund's rule ?**

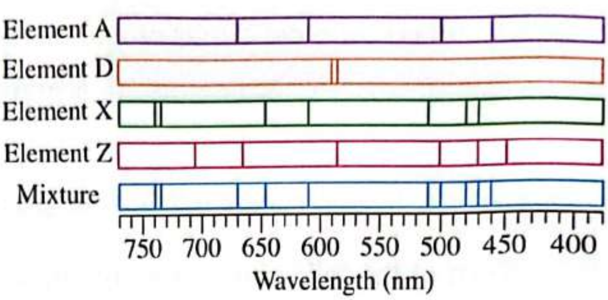
ⓐ [↑↓] [↓ | ↓ | ↓] ⓑ [↑↓] [↑↓ | ↑↓ | ↑]

ⓒ [↑↓] [↑↓ | ↑↓ |] ⓓ [↑↓] [↑↑ | ↑↓ |]



7 The opposite figure represents the line spectra of four elements A , D , X , and Z , and of a mixture of two of these elements.

What are these two elements ?



ⓐ D and A
ⓑ X and A
ⓒ D and Z
ⓓ X and Z

8 Which of the following represents correctly the relation between fluorine and chlorine atoms ?

ⓐ $F_{(g)} < Cl_{(g)}$ regarding the energy released from each of them on gaining an electron.
ⓑ F < Cl regarding the ability of each of them to attract the electrons of H – X bond.
ⓒ Cl < F regarding half the distance between the two atoms of the molecule of each of them.
ⓓ Cl < F regarding the subsidiary quantum number of the last electron in each of them.

9 The last principal energy level in the element X (n = 5) contains 5 electrons.

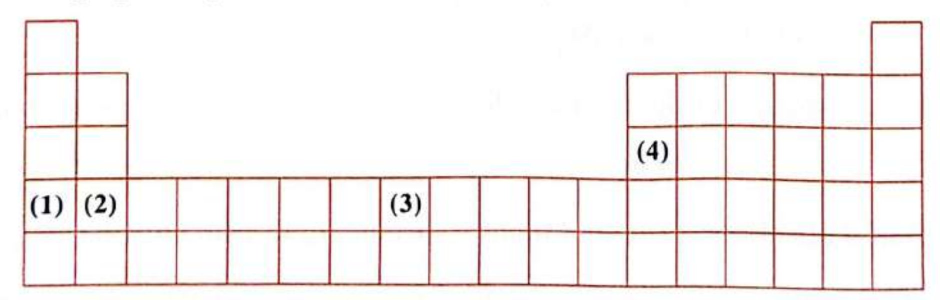
What is the type of its oxide X_2O_3 ?

ⓐ Acidic.
ⓑ Neutral.
ⓒ Basic.
ⓓ Amphoteric.

10 Which of the following represents the correct graduation in the atomic radius ?

ⓐ F > Cl > S
ⓑ S > F > Cl
ⓒ Cl > S > F
ⓓ S > Cl > F

11 The following figure represents a section in the periodic table :



What is the number of the element (X), which is characterized by a large atomic radius and good electric conductivity, and forms with chlorine XCl_2 and XCl_3 compounds ?

ⓐ (1)
ⓑ (2)
ⓒ (3)
ⓓ (4)

12 **(P) and (Q) are two atoms of two different elements :**

- **Number of protons in atom (P) is less than that in atom (Q) by 9**
- **Number of unpaired electrons in atom (P) is more than that in atom (Q) by 1**

What does this indicate about the elements (P) and (Q) ?

ⓐ Element (P) is carbon and element (Q) is phosphorus only.

ⓑ Element (P) is nitrogen and element (Q) is sulphur only.

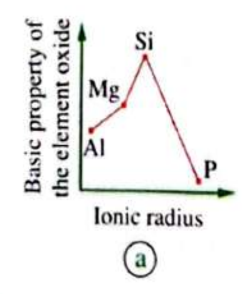
ⓒ Elements (P) and (Q) may be carbon and phosphorus or oxygen and chlorine.

ⓓ Elements (P) and (Q) may be nitrogen and sulphur or oxygen and chlorine.

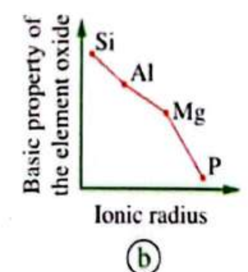
13 **What is the number of the sublevels and that of the orbitals which are occupied by electrons in an ion of a metal whose electron configuration ends with the sublevel $(2p^6)$?**

Choices	Number of sublevels	Number of orbitals occupied by electrons
ⓐ	6	5
ⓑ	5	3
ⓒ	5	7
ⓓ	3	5

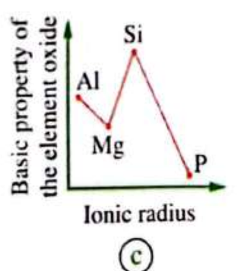
14 **Which of the following graphs represents the relation between the basic property of the element oxide and its ionic radius ?**



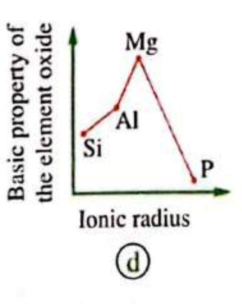
ⓐ



ⓑ



ⓒ



ⓓ

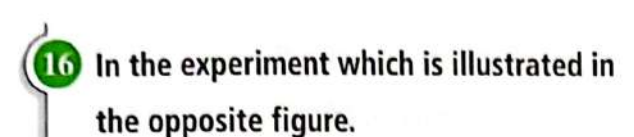
15 **In which of the following pairs of substances do the nitrogen atoms have the same oxidation state ?**

ⓐ HNO_3 , N_2O_5

ⓑ NO , HNO_2

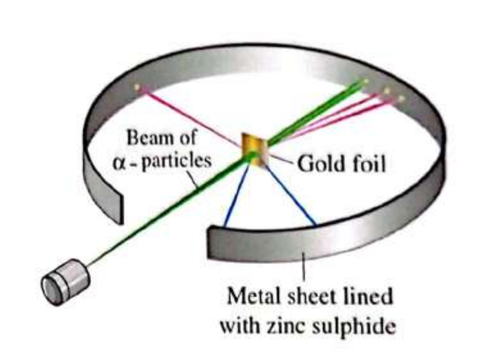
ⓒ N_2 , N_2O

ⓓ HNO_2 , HNO_3



16 In the experiment which is illustrated in the opposite figure.

What is the postulate which could not be concluded from this experiment ?



ⓐ The atom is not solid.

ⓑ The atom contains a positively charged part.

ⓒ It is possible that the electrons are present in the electron cloud which surrounds the nucleus.

ⓓ The dense part in the atom occupies a tiny space.

17 The following table shows the first seven ionization potentials of the element (X) :

Ionization potentials (kJ/mol)						
First	Second	Third	Fourth	Fifth	Sixth	Seventh
+870	+1800	+3000	+3600	+5800	+7000	+13200

Which of the following statements is true for the element (X) ?

ⓐ It contains a half filled *p* sublevel.

ⓑ It forms with beryllium a compound whose formula is BeX_2

ⓒ It is located in the fourth period in the periodic table.

ⓓ It has a first ionization potential less than that of the element which precedes it in the periodic table.

18 The actual path of the last electron in sodium atom cannot be precisely determined, the previous statement is an application of ....

ⓐ Hund's rule.

ⓑ uncertainty principle.

ⓒ Bohr's rule.

ⓓ the dual nature of electron.

19 The electronic configuration of molybdenum element $_{42}Mo$ is ....

ⓐ [Kr] , $5s^1$, $4d^{10}$

ⓑ [Kr] , $5s^2$, $4d^4$

ⓒ [Kr] , $5s^1$, $4d^5$

ⓓ [Kr] , $5s^2$, $4d^5$

20 Which of the following includes an orbital of *3d* sublevel that contains one pair of electrons, while its *4s* sublevel is completely filled with electrons ?

ⓐ $_{29}Cu$

ⓑ $_{26}Fe$

ⓒ $_{28}Ni^{2+}$

ⓓ $_{38}Sr^{2+}$

21 Arsenic atom $_{33}As$ gains 3 electrons when it combines with sodium to form Na_3As
What are the four quantum numbers of the first electron of these gained electrons ?

ⓐ $n = 4, l = 0, m_l = -1, m_s = -\frac{1}{2}$

ⓑ $n = 4, l = 1, m_l = -1, m_s = -\frac{1}{2}$

ⓒ $n = 3, l = 0, m_l = 0, m_s = +\frac{1}{2}$

ⓓ $n = 3, l = 1, m_l = -1, m_s = -\frac{1}{2}$

22 What is the block in the periodic table in which most of the metallic elements are located ?

....



23 The only compound that Dalton knew the ratios of its components was water (as in the table), he thought that the ratio between the number of hydrogen atoms to the number of oxygen atoms, equals 1 : 1

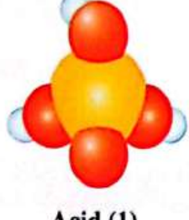
Oxygen	Hydrogen
87%	13%

What is the molecular formula of water as Dalton thought ?

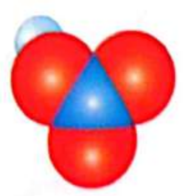
....



24 Arrange the following oxygenated acids ascendingly according to their strength :


Acid (1)


Acid (2)


Acid (3)

....

1 mark

25 **Classify the elements which have the following electronic configurations into two groups, with mentioning the type of the elements of each group :**

(1) $1s^2, 2s^2, 2p^5$

(2) $1s^2, 2s^1$

(3) $1s^2, 2s^2, 2p^6$

(4) $1s^2, 2s^2, 2p^6, 3s^2, 3p^5$

(5) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$

(6) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6$

....

....

....

....

....



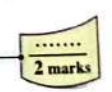
26 **Show the oxidation and the reduction processes which occur in the following equation, with determining the oxidizing agent and the reducing agent :**

$$2P + 5HClO + 3H_2O \longrightarrow 2H_3PO_4 + 5HCl$$

....

....

....

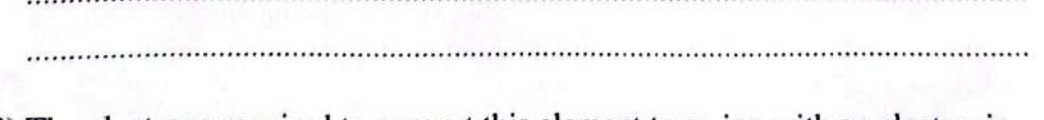


27 **A representative element contains four principal energy levels occupied by electrons and the last energy sublevel contains three unpaired electrons. Calculate the number of :**

(1) The orbitals which are completely filled with electrons.

....

....



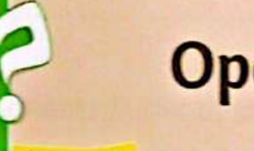
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(2) The electrons required to convert this element to an ion with an electronic configuration similar to the noble gas which follows it.

....

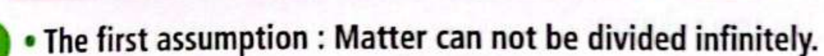


Exam model 11



Answered

Open Book



Choose the correct answer for the questions 1 : 21

1 • The first assumption : Matter can not be divided infinitely.

• The second assumption : Matter is able to be changed infinitely.

Who were the first to assume these assumptions ?

Choices	First assumption	Second assumption
(a)	Schrödinger	Heisenberg
(b)	Bohr	Boyle
(c)	Dalton	Rutherford
(d)	Democritus	Aristotle

2 All the following sets of quantum numbers are possible, except ....

(a) $n = 3 , \ell = 2 , m_\ell = -2 , m_s = +\frac{1}{2}$

(b) $n = 4 , \ell = 0 , m_\ell = 0 , m_s = -\frac{1}{2}$

(c) $n = 3 , \ell = 2 , m_\ell = -3 , m_s = +\frac{1}{2}$

(d) $n = 5 , \ell = 3 , m_\ell = 0 , m_s = -\frac{1}{2}$

3 Which of the following sublevels can absorb a photon but can not lose one ?

(a) *3d* (b) *2p* (c) *1s* (d) *2s*

4 Which of these elements can have positive or negative oxidation number in its compounds ?

(a) Cesium. (b) Fluorine.

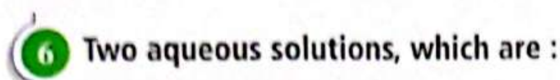
(c) Iodine. (d) Krypton.

5 Assuming disregarding aufbau principle.

What is the block which calcium element would belong to ?

(a) s-block. (b) p-block.

(c) d-block. (d) f-block.



6. Two aqueous solutions, which are :

- The first : $M_1 - O - H$
- The second : $M_2 - O - H$

If the electronegativities of the elements are : [$M_1 = 3.4$, $M_2 = 1.2$, $O = 3.5$, $H = 2.1$].

What are the types of the two solutions ?

Choices	First solution	Second solution
ⓐ	Acidic	Basic
ⓑ	Acidic	Acidic
ⓒ	Basic	Acidic
ⓓ	Basic	Basic

7. What is the electron configuration of the valence electrons of the element whose atomic number is 23 ?

ⓐ $3d^5$
ⓑ $3d^3, 4s^2$
ⓒ $3d^2, 4s^1, 4p^1$
ⓓ $4d^3, 4s^2, 4p^1$

8. Metals which are located in the beginning of each period are characterized by ....

ⓐ small atomic radius.
ⓑ high ionization potential.
ⓒ high electronegativity.
ⓓ low ionization potential.

9. What is the maximum number of electrons that have the quantum numbers ($n = 3$), ($\ell = 2$) ?

ⓐ 2
ⓑ 8
ⓒ 10
ⓓ 18

10. Which of the following elements is the strongest reducing agent ?

ⓐ Al
ⓑ Mg
ⓒ Zn
ⓓ Cu

11. What is the equation which represents the first ionization potential of barium ?

ⓐ $Ba_{(s)} \longrightarrow Ba^+_{(g)} + e^-$
ⓑ $Ba^+_{(g)} \longrightarrow Ba^{2+}_{(g)} + e^-$
ⓒ $Ba^{2+}_{(g)} + e^- \longrightarrow Ba^+_{(g)}$
ⓓ $Ba_{(g)} \longrightarrow Ba^+_{(g)} + e^-$

12 **(X) and (Y) are two different elements in the third period in the periodic table, so if :**

- The oxide of the element (X) is insoluble in water but it reacts with each of NaOH and HCl
- The chloride of the element (Y) is soluble in water forming colourless acidic solution.

Which of the following choices represents the elements (X) and (Y) ?

Choices	Element (X)	Element (Y)
ⓐ	Al	P
ⓑ	Al	Zn
ⓒ	Mg	P
ⓓ	Mg	Si

13 **The element (Q) forms an ion having the following properties :**

- Has the same electron configuration of the noble gas which precedes it in the periodic table.
- Number of its protons is higher than that of its electrons.
- Formed by losing electrons from one orbital.

Which of the following elements is likely to be element (Q) ?

ⓐ Aluminum ($_{13}Al$).

ⓑ Calcium ($_{20}Ca$).

ⓒ Copper ($_{29}Cu$).

ⓓ Sulphur ($_{16}S$).

14 **The first ionization potential of element (Y) is higher than that of element (X).**
What are the two elements (X) and (Y) ?

Choices	Element (X)	Element (Y)
ⓐ	$_{12}Mg$	$_{13}Al$
ⓑ	$_{7}N$	$_{8}O$
ⓒ	$_{10}Ne$	$_{11}Na$
ⓓ	$_{19}K$	$_{11}Na$

15 **What is the reducing agent in the reaction : $H_2S + I_2 \longrightarrow S + 2H^+ + 2I^-$?**

ⓐ H_2S

ⓑ I_2

ⓒ S

ⓓ H^+

16 **Which of the following statements represents properly the effective nuclear charge ?**

ⓐ It decreases in the same period in the periodic table by increasing the atomic number.

ⓑ It increases in the same period in the periodic table with moving from left to right.

ⓒ It does not change in the same period in the periodic table by increasing the atomic number.

ⓓ It increases then decreases in the same period in the periodic table with moving from left to right.

17 **Which of the following choices states the types of lithium and magnesium elements ?**

Choices	Lithium	Magnesium
ⓐ	Nonmetal	Metal
ⓑ	Nonmetal	Nonmetal
ⓒ	Metal	Metal
ⓓ	Metalloid	Metalloid

18 **Which of the following choices represents the electron affinity of chlorine ?**

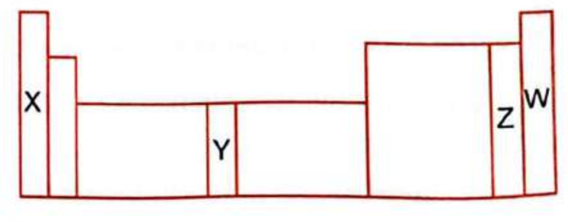
ⓐ $Cl^-_{(g)} \longrightarrow Cl^+_{(g)} + e^-$

ⓑ $Cl_{(g)} + e^- \longrightarrow Cl^-_{(g)}$

ⓒ $Cl^-_{(g)} \longrightarrow Cl^{2-}_{(g)} + e^-$

ⓓ $Cl_{(g)} \longrightarrow Cl^-_{(g)} + e^-$

19 **The opposite figure represents a section in the periodic table. Which of the following groups its elements exist as monatomic gases ?**



ⓐ X

ⓑ Y

ⓒ Z

ⓓ W

20 **What is the electronic configuration of the first element in p-block in the fourth period in the periodic table ?**

ⓐ [Ar] , $4s^2$, $3d^{10}$, $4p^1$

ⓑ [Ar] , $4s^1$

ⓒ [Kr] , $5s^2$, $4d^{10}$, $5p^1$

ⓓ [Kr] , $5s^1$

21 **In 1806, the scientist Joseph Proust found that a given chemical compound always contains its components in a fixed ratio (by mass), he called that belief the law of definite proportion.**

What is the atomic theory which explained the law of definite proportion simply ?

ⓐ Dalton's atomic theory.

ⓑ Thomson's atomic theory.

ⓒ Bohr's atomic theory.

ⓓ Rutherford's atomic theory.

22 **Was Pauli's principle applied to** the distribution of the electrons in the following orbitals ? **Explain.**

↑↑	↑↓	↑↓	↑	
1s	*2s*	*2p*		

....

.... 2 marks

23 **Why is it difficult to obtain** M^{2+} ion from the element which is located in the third period, group (1A) ?

....

....

....

....

.... 1 mark

24 **Illustrate the oxidizing agent and the reducing agent in the reaction which is represented by the equation :** $6H^+ + 6I^- + ClO_3^- \longrightarrow 3I_2 + 3H_2O + Cl^-$

....

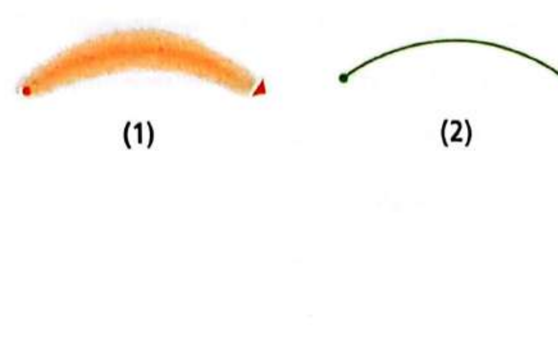
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....

.... 1 mark

25 **The opposite figures show** two different perceptions of the movement of the electrons around the nucleus.

Which of them assumes the possibility of determining the position of the electron precisely ? **To whom this assumption is attributed ?**



....



26 **A representative element (M) whose electrons are distributed in 2 principal levels, and the last sublevel contains 3 unpaired electrons :**

(1) **Determine** the location of this element in the modern periodic table.

....

....

(2) **What** is the block of this element ?

....



27 **The following figure illustrates a section in the modern periodic table :**

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe

(1) **What** is the number of the representative elements in this section ?

....

(2) **Write** the electronic configuration of Ge

....



Exam model 12 Open Book

Answered

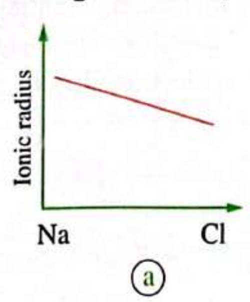
Choose the correct answer for the questions  1 : 21

1 What is the electron configuration which is consistent with Pauli's principle ?

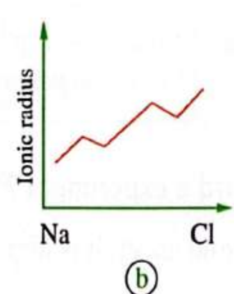
ⓐ $1s^2, 2s^2, 2p^7$ ⓑ $1s^2, 2s^2, 2p^6, 3s^3$

ⓒ $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{12}$ ⓓ $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

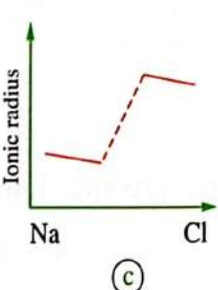
2 Which of the following graphical figures represents the change in the ionic radius along the third period elements from Na to Cl ?



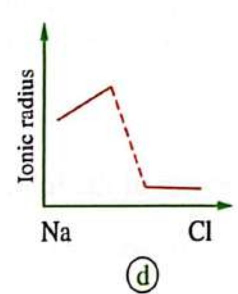
ⓐ



ⓑ



ⓒ



ⓓ

3 The following reaction represents the total reaction in the rechargeable nickel-cadmium battery : $Cd + 2NiOOH + 4H_2O \longrightarrow Cd(OH)_2 + 2Ni(OH)_2.H_2O$

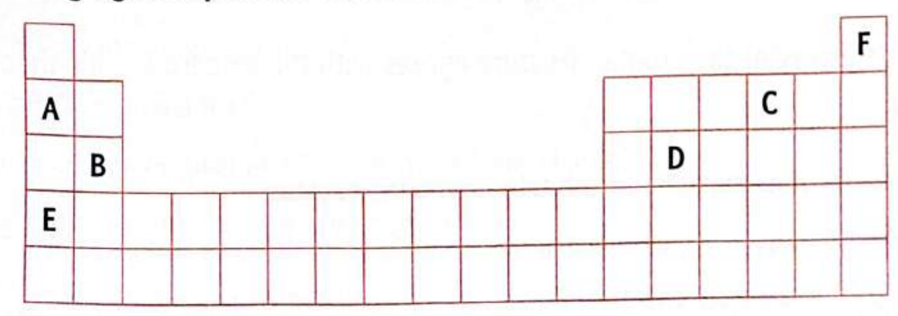
What are the oxidation numbers of nickel before the beginning of the reaction and at the end of it respectively ?

ⓐ +1.5 , +2 ⓑ +2 , +3 ⓒ +3 , +4 ⓓ +3 , +2

4 What is the least principal quantum number (n) of the two electrons in the first orbital in *d* sublevel ?

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

5 The following figure represents a section in the periodic table.



What is the choice which represents the movement from a metal to a metalloid ?

ⓐ A ⟶ E ⓑ E ⟶ A ⓒ A ⟶ C ⓓ B ⟶ D

6 Which of the following elements has the highest electronegativity ?

ⓐ Aluminum. ⓑ Silicon.

ⓒ Phosphorus. ⓓ Sulphur.

7 Which of the following choices is correct ?

Choices	$Cl_{(g)} \longrightarrow Cl^-_{(g)}$	$Cl^-_{(g)} \longrightarrow Cl_{(g)}$	$Cl_{(g)} \longrightarrow Cl^+_{(g)}$	$Cl^+_{(g)} \longrightarrow Cl^{2+}_{(g)}$
ⓐ	Electron affinity	Ionization potential	–	–
ⓑ	–	Ionization potential	Ionization potential	–
ⓒ	Electron affinity	–	–	Ionization potential
ⓓ	–	–	Ionization potential	Electron affinity

8 Which of the following represents Rutherford's experiment ?

ⓐ When a beam of beta particles falls on a gold sheet, it is absorbed.

ⓑ When a beam of gamma rays falls on a gold sheet, it liberates electrons.

ⓒ When a beam of helium atoms falls on a gold sheet, it is deflected.

ⓓ When a beam of helium nuclei falls on a gold sheet, it is deflected.

9 The two electrons of the same orbital in any atom are distinct in the quantum number ....

ⓐ m_s ⓑ m_ℓ ⓒ ℓ ⓓ n

10 What is the number of electrons which have the quantum numbers (n = 3), (ℓ = 2) in iron atom ?

ⓐ 2 ⓑ 4 ⓒ 6 ⓓ 8

11 Bohr's theory of the atomic structure agrees with the modern atomic theory on that ....

ⓐ the electrons move in the orbitals around the nucleus.

ⓑ the electrons lose energy when they transfer from the principal level (n + 2) to the principal level (n).

ⓒ the orbital cannot be occupied by more than 2 electrons.

ⓓ the energies of the sublevels in the same principal level are different.

12 Which of the following choices represents the electron configuration of the atom and the two ions of copper in the stable state ?

Choices	Cu	Cu^+	Cu^{2+}
ⓐ	[Ar], $4s^1$, $3d^{10}$	[Ar], $3d^{10}$	[Ar], $3d^9$
ⓑ	[Ar], $4s^2$, $3d^9$	[Ar], $4s^1$, $3d^9$	[Ar], $3d^9$
ⓒ	[Ar], $4s^1$, $3d^{10}$	[Ar], $4s^1$, $3d^9$	[Ar], $4s^1$, $3d^8$
ⓓ	[Ar], $4s^2$, $3d^9$	[Ar], $4s^2$, $3d^8$	[Ar], $4s^2$, $3d^7$

13 Which of the following equations represents the second ionization potential of oxygen ?

ⓐ $O_{(g)} \longrightarrow O^{2+}_{(g)} + 2e^-$

ⓑ $O_{(g)} \longrightarrow O^{+}_{(g)} + e^-$

ⓒ $O^{-}_{(g)} + e^- \longrightarrow O^{2-}_{(g)}$

ⓓ $O^{+}_{(g)} \longrightarrow O^{2+}_{(g)} + e^-$

14 Why does the absorption spectrum of hydrogen contain separate lines ?

ⓐ Because there are certain energy levels in which the electron is allowed to revolve.

ⓑ Because it contains only one electron.

ⓒ Because it contains only one proton.

ⓓ Because the spectrum is recorded at low temperature.

15 The following ionic equation represents one of the chemical reactions :

$$MnO^-_{4(aq)} + 8H^+_{(aq)} + 5Fe^{2+}_{(aq)} \longrightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)} + 5Fe^{3+}_{(aq)}$$

Which of the following statements is correct ?

ⓐ Each Fe^{2+} ion gains 5 electrons.

ⓑ Each H^+ ion is oxidized.

ⓒ The oxidation number of Mn is changed from –1 to +2

ⓓ The oxidation number of Mn is changed from +7 to +2

16 What happens to the spaces between energy levels on moving from (n = 1) to (n = 7) ?

ⓐ Decrease by increasing (n).

ⓑ Do not change.

ⓒ Increase by increasing (n).

ⓓ Change irregularly.

17 On moving in group (1A) from lithium to rubidium ....

ⓐ the atomic radius decreases.

ⓑ the ionic radius increases.

ⓒ the first ionization potential increases.

ⓓ the electronegativity increases.

18 Two elements in the periodic table are symbolized hypothetically by the symbols (R) and (T), if the element (R) is located in group (4A) and the element (T) is located in group (6A).

What is the formula of the compound produced from the combination of the two elements ?

ⓐ RT

ⓑ RT_6

ⓒ RT_2

ⓓ R_2T

19 The following table represents the properties of four elements (W , X , Y and Z) in the third period in the periodic table :

Element	(W)	(X)	(Y)	(Z)
Reaction with cold water	Reacts vigorously	Does not react	Reacts slowly	Reacts slowly
Reactions of the element oxide	Reacts with acids	Reacts with bases	Reacts with acids and bases	Reacts with acids

Which of the following choices represents increasing the atomic number of these elements ?

ⓐ W < X < Y < Z

ⓑ W < Z < Y < X

ⓒ Y < W < X < Z

ⓓ Z < X < Y < W

20 Each of the following can be confirmed undoubtedly, <u>except</u> ....

ⓐ the number of energy levels which are occupied by electrons in $_{12}Mg$ atom.

ⓑ the number of orbitals which are occupied by unpaired electrons in $_{26}Fe$ atom.

ⓒ the position and the speed of the electron in hydrogen atom at a certain moment.

ⓓ the difference of the properties of the cathode rays with the difference of the type of the substance of the cathode.

21 The two electrons which have the same l and m_l values are located in the same ....

(a) principal level.

(b) sublevel.

(c) orbital.

(d) atoms of the elements of the same period.

22 Why is the electronic configuration ($1s^2$, $2s^2$, $2p^7$) incorrect ?

....

....

.... / 1 mark

23 How many unpaired electrons are present in $_{27}Co^{3+}$ ion in its gaseous ground state ?

....

....

.... / 1 mark

24 What are the types of the elements which are found in the sixth period in the periodic table ?

....

....

.... / 1 mark

25 The opposite figure represents one of the postulates of an atomic theory that you have studied :

(1) What is the name of this theory ?

....

....

(2) State the postulate represented in the figure.

....

....

.... / 2 marks

26 **In the process which is represented by the following equation :**

$$Zn_{(g)} + S_{(g)} \longrightarrow Zn^{2+}_{(g)} + S^{2-}_{(g)}$$

(1) **What is the name** of the required energy when $Zn_{(g)}$ is converted to $Zn^{+}_{(g)}$?

....

(2) **Suggest one use** for the solid substance which is produced from the combination of the previous cation and anion.

....

....

....

.... 2 marks

27 **Phosphoric acid H_3PO_4 is used in the industry of phosphate fertilizers :**

(1) **Deduce** the number of oxygen atoms which are nonbinded with hydrogen in this acid.

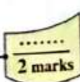
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(2) **Write** the balanced symbolic equation which represents the reaction of phosphoric acid with magnesium oxide.

....



Exam model 13 ?

Open Book

Answered

Choose the correct answer for the questions 1 : 21

1 The ability of the gases to conduct electricity can be enhanced by ....

ⓐ increasing the gas pressure as well as the potential difference between the two electrodes of the conducting tube.

ⓑ decreasing the gas pressure as well as the potential difference between the two electrodes of the conducting tube.

ⓒ decreasing the gas pressure and increasing the potential difference between the two electrodes of the conducting tube.

ⓓ increasing the gas pressure and decreasing the potential difference between the two electrodes of the conducting tube.

2 The energies of the different orbitals in the atom or ion which contains one electron depend on ....

ⓐ n only.

ⓑ n and ℓ only.

ⓒ n , ℓ and m_ℓ only.

ⓓ n , ℓ , m_ℓ and m_s

3 Which of the following sets of atomic numbers belongs to elements located in group 16 in the periodic table ?

ⓐ 8 , 16 , 32 , 54

ⓑ 16 , 34 , 54 , 86

ⓒ 8 , 16 , 34 , 52

ⓓ 10 , 16 , 32 , 50

4 What is the electron configuration which represents an excited atom ?

ⓐ [Ne], $3s^2$, $3p^6$, $4s^2$, $3d^8$

ⓑ [Ne], $3s^2$, $3p^6$, $4s^1$, $3d^5$

ⓒ [Ne], $3s^2$, $3p^6$, $4s^2$, $3d^1$

ⓓ $1s^2$, $2s^2$, $2p^5$, $3s^1$

5 Which of the following elements atoms gains an electron with higher difficulty than others ?

ⓐ Radon.

ⓑ Nitrogen.

ⓒ Oxygen.

ⓓ Radium.

6. The opposite table shows the oxidation numbers of three elements A , B and C in a compound. What is the probable molecular formula of this compound ?

Element	A	B	C
Oxidation number	+2	+5	–2

ⓐ $A_3(B_4C)_2$
ⓑ $A_3(BC_4)_2$
ⓒ $A_2(BC_3)_2$
ⓓ ABC_2

7. Each of the following relations represents correctly one property in the elements of the periodic table, except ....

Choices	Relation	Property
ⓐ	$Fe^{3+} > Fe^{2+}$	Ionic radius
ⓑ	O > N	Second ionization potential
ⓒ	Cu > Zn	Atomic size
ⓓ	Ti > In	First ionization potential

8. How many quanta are released when the electron in hydrogen atom jumps from (n = 4) to (n = 1) ?

ⓐ 6
ⓑ 3
ⓒ 2
ⓓ 1

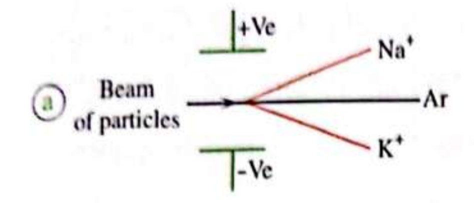
9. What is the number of the points in $2p_x$ orbital in which the electron density equals zero ?

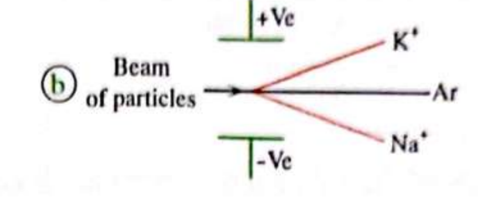
ⓐ Zero
ⓑ 1
ⓒ 2
ⓓ Infinite number.

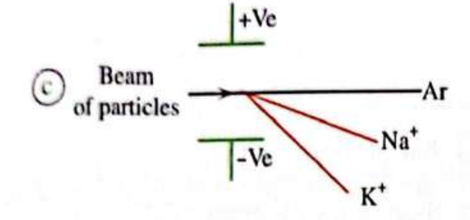
10. Which of the following groups includes metalloids ?

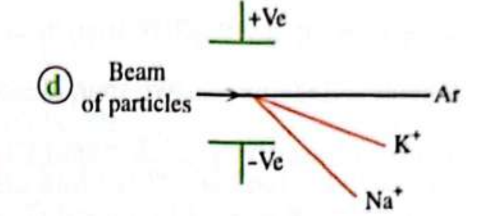
ⓐ Group 8
ⓑ Group 16
ⓒ Group 2
ⓓ Group 18

11 A beam of Na^+ , K^+ and Ar particles passes between two charged plates. What is the correct figure which represents the effect of the charged plates on these particles ?

ⓐ 

ⓑ 

ⓒ 

ⓓ 

12 The opposite compound is formed of four elements W , X , Y and Z, which are located in different groups in the periodic table.
What are the numbers of the groups of this compound elements in the periodic table ?

$$\mathrm{Z-W\equiv W-\underset{Z}{\overset{Z}{\underset{|}{\overset{|}{W}}}}-\underset{Z}{\underset{|}{X}}-\overset{Y}{\overset{\|}{W}}-Z}$$

Choices	(W)	(X)	(Y)	(Z)
ⓐ	Group (3A)	Group (5A)	Group (6A)	Group (1A)
ⓑ	Group (4A)	Group (3A)	Group (6A)	Group (7A)
ⓒ	Group (3A)	Group (5A)	Group (2A)	Group (1A)
ⓓ	Group (4A)	Group (5A)	Group (6A)	Group (7A)

13 Which of the following diatomic molecules has the shortest bond length ?

ⓐ N_2
ⓑ O_2
ⓒ F_2
ⓓ S_2

14 Which of the following changes represents an oxidation process ?

ⓐ $NO_2^- \longrightarrow N_2$
ⓑ $VO^{2+} \longrightarrow VO_3^-$
ⓒ $ClO^- \longrightarrow Cl^-$
ⓓ $CrO_4^{2-} \longrightarrow Cr_2O_7^{2-}$

15 **The following table represents a section in the periodic table :**

Periods	Groups							
	(1A)	(2A)	(3A)	(4A)	(5A)	(6A)	(7A)	(0)
(2)	V	W					X	
(3)	Y						Z	

Which of the following statements is correct ?

ⓐ Element (V) is more active than element (Y).

ⓑ Element (Z) is more active than element (X).

ⓒ The electronegativity of element (Y) is less than that of element (V).

ⓓ The metallic property of element (W) is stronger than that of element (V).

16 **Each of the following electron configurations is consistent with Hund's rule, <u>except</u>** ....

ⓐ [↑↓] [↑↓] [| |]

ⓑ [↑↑] [↑↓] [| |]

ⓒ [↑↓] [↑↓] [↑↓ | |]

ⓓ [↑↓] [↑↓] [↑ | ↑ | ↑]

17 **What are the possible values of the quantum numbers n and m_l of an electron in one of the orbitals of *5p* sublevel ?**

ⓐ n = 1 , 2 , 3 , 4 , 5 / m_l = +1

ⓑ n = 1 , 2 , 3 , 4 , 5 / m_l = −2 , −1 , 0 , +1 , +2

ⓒ n = 5 / m_l = −1 , 0 , +1

ⓓ n = 5 / m_l = +1

18 **The nucleus of manganese atom Mn contains 25 protons.**

What is the electron configuration of manganese in $Mn_3(PO_4)_2$?

ⓐ [Ar] , $3d^6$

ⓑ [Ar] , $3d^5$

ⓒ [Ar] , $3d^3$, $4s^2$

ⓓ [Ar] , $3d^5$, $4s^2$

19 The opposite table represents the values of the first five ionization potentials of an element in the third period.

Ionization potentials (kJ/mol)				
First	Second	Third	Fourth	Fifth
+578	+1817	+2745	+11578	+14831

Which of the following illustrates the correct sequence of the orbitals from which the five electrons are lost in the different ionization processes ?

ⓐ $1s \longrightarrow 2s \longrightarrow 2p \longrightarrow 3s \longrightarrow 3p$

ⓑ $1s \longrightarrow 1s \longrightarrow 2s \longrightarrow 2s \longrightarrow 2p$

ⓒ $3p \longrightarrow 3s \longrightarrow 2p \longrightarrow 2s \longrightarrow 1s$

ⓓ $3p \longrightarrow 3s \longrightarrow 3s \longrightarrow 2p \longrightarrow 2p$

20 Which of these elements their number is the highest in the fourth period in the periodic table ?

ⓐ p-block elements.

ⓑ Representative elements.

ⓒ Transition elements.

ⓓ Metals.

21 What is the chemical formula of the oxygenated acid which is formed of hydrogen, bromine and oxygen elements and the ratio of (n : m) in it is (1 : 1) ?

ⓐ $HBrO_4$ ⓑ $HBrO$ ⓒ $HBrO_2$ ⓓ $HBrO_3$

22 Calculate the bond length in a formula unit of lithium chloride in terms of the radii which are illustrated in the following table :

	Li	Li^+	Cl	Cl^-
The radius	1.57 Å	0.68 Å	0.99 Å	1.81 Å

....

....

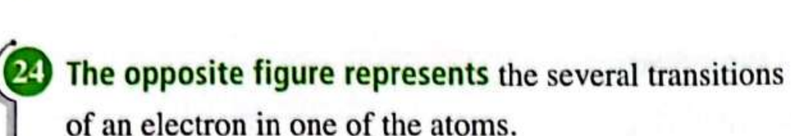
.... 1 mark

23 Does the opposite figure represent a cathode tube ? Confirm your answer with one reason from what you have studied.

....

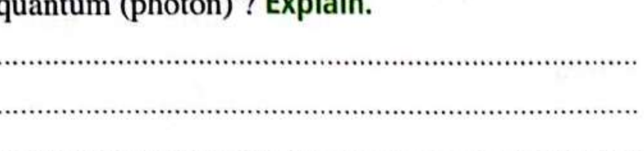
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.... 1 mark



24 **The opposite figure represents** the several transitions of an electron in one of the atoms.

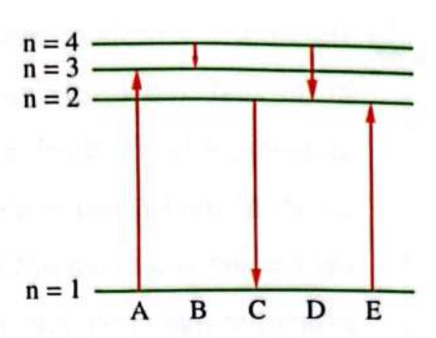
Which of these transitions represents an emission quantum (photon) ? **Explain.**



....

....

....



.... 1 mark

25 **The opposite figure represents the locations of the elements W , X , Y and Z in the periods (2) and (3) in the periodic table, the element Y reacts with chlorine forming YCl_5 compound.**

Second period		W		
Third period	X		Y	Z

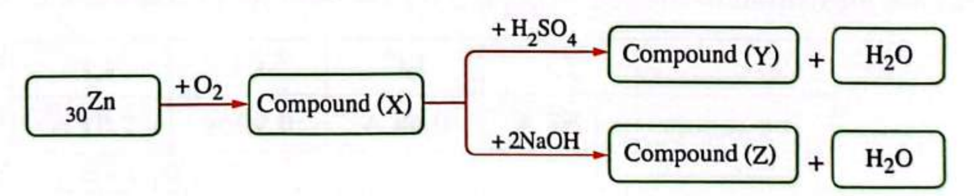
Answer the following :

(1) **Determine** the number of the group of the element (X). (.....................)

(2) **What** is the maximum oxidation number of the element (Z) in its compounds ? (.....................)



26 **Study the following scheme, then answer the following :**



(1) **Write** the electronic configuration of the cation of the compound (Y).

....

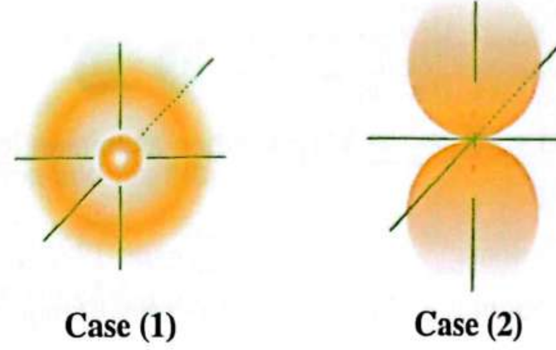
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(2) **What** is the name of compound (Z) ?

....

.... 2 marks

27 **The following figures illustrate the possible electron cloud of the excited hydrogen electron in two different cases :**



Case (1) Case (2)

(1) **Write** the possible (ℓ) and (m_ℓ) values of each electron in these two cases.

....

....

(2) **What** is the principal quantum number (n) which is not possible for this electron in the two cases ?

....



.... 2 marks

Exam model 14  Open Book

Answered

Choose the correct answer for the questions 1 : 21

1. In the equation : $4Al + 3O_2 \longrightarrow 2Al_2O_3$ when aluminum loses 12 mol of electrons, so oxygen ....

   ⓐ gains 4 mol of electrons.
   ⓑ gains 12 mol of electrons.
   ⓒ loses 4 mol of electrons.
   ⓓ loses 12 mol of electrons.

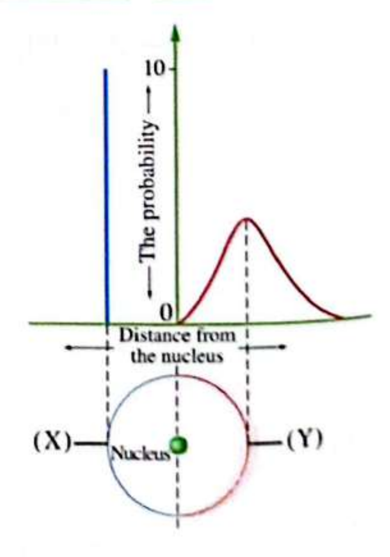
2. Which of the following choices represents the quantum numbers of the 19th electron in the atom of an element with atomic number 24 ?

Choices	n	ℓ	m_ℓ	m_s
ⓐ	4	0	0	$+\frac{1}{2}$
ⓑ	4	1	–1	$-\frac{1}{2}$
ⓒ	3	2	+2	$+\frac{1}{2}$
ⓓ	3	2	–2	$-\frac{1}{2}$

3. Which of the following represents the electron configuration of sodium atom in the ground state that violates aufbau principle only ?

   ⓐ [↑↓] [↑↓] [↑↑|↓↓|↑↑] [↑]
   ⓑ [↑↓] [↑↓] [↑↓|↑↓|] [↑↓]
   ⓒ [↑↑] [↓↓] [|↑↓|↑↓] [↑↓]
   ⓓ [↑] [↑↓] [↑↓|↑↓|↑↓] [↑↓]

4. Which of the following describes each of (X) and (Y) in the opposite figure ?



Choices	(X)	(Y)
ⓐ	Orbital	Orbital
ⓑ	Orbit	Electron cloud
ⓒ	Orbit	Orbital
ⓓ	Orbit	Orbit

5 The following electron configurations belong to the atoms of known elements, except ....

ⓐ [Kr], $5s^2$, $4d^8$
ⓑ [Kr], $5s^2$, $4d^{10}$
ⓒ [Ar], $4s^1$, $3d^5$
ⓓ [Ar], $3d^{10}$

6 Based on the equation and the table :

$K_{(g)} + Cl_{(g)} \longrightarrow K^+_{(g)} + Cl^-_{(g)}$ $\Delta H = ?$

	Ionization potential	Electron affinity
Potassium	+418 kJ/mol	−48 kJ/mol
Chlorine	+1255 kJ/mol	−349 kJ/mol

What is the value of ΔH of this process ?

ⓐ 1303 kJ/mol
ⓑ 1207 kJ/mol
ⓒ 767 kJ/mol
ⓓ 69 kJ/mol

7 Which of the following elements is located in the fourth period, where the value of (n) of its last electron is as high as possible and its (ℓ) value is the least ?

ⓐ Calcium.
ⓑ Manganese.
ⓒ Tin.
ⓓ Cesium.

8 What are the two ions forming Li_3N ?

ⓐ Li^+ , N^{3-}
ⓑ Li_3^+ , N^-
ⓒ Li^+ , N^-
ⓓ Li^{3+} , N^{3-}

9 The following equations represent the probable reactions of the oxides of the two metals (M) and (X) with hydrochloric acid and sodium hydroxide.

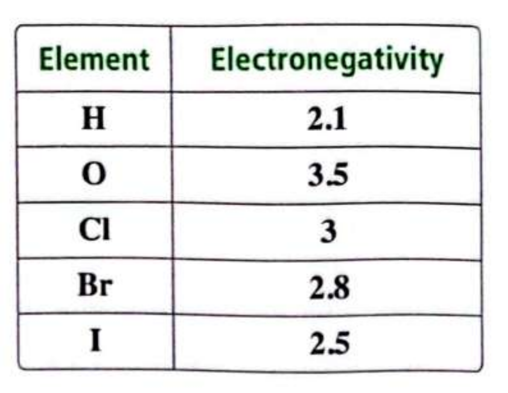
- $MO_{(s)} + 2HCl_{(aq)} \longrightarrow MCl_{2(aq)} + H_2O_{(\ell)}$
- $XO_{2(g)} + 2NaOH_{(aq)} \longrightarrow Na_2XO_{3(aq)} + H_2O_{(\ell)}$

What are the probable symbols of (M) and (X) ?

Choices	Element (M)	Element (X)
ⓐ	Al	Cl
ⓑ	K	C
ⓒ	Mg	C
ⓓ	Na	Cl

10 Assisted by the values of electronegativity shown in the table.

What is the correct order of the strengths of these acids ?



Element	Electronegativity
H	2.1
O	3.5
Cl	3
Br	2.8
I	2.5

ⓐ HIO > HBrO > HClO

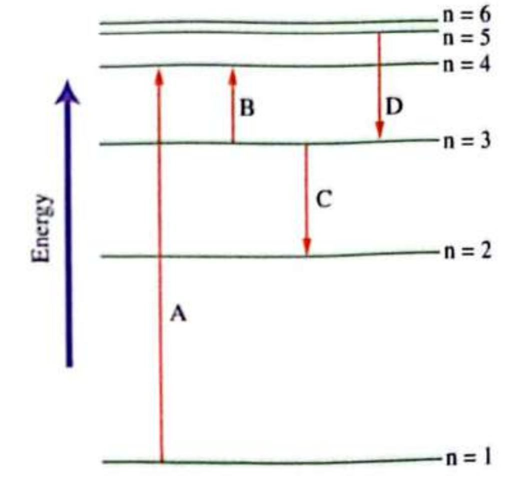
ⓑ HClO > HBrO > HIO

ⓒ HIO > HClO > HBrO

ⓓ HBrO > HClO > HIO

11 The opposite figure illustrates some travels of the electron of hydrogen atom between the different energy levels.

Which of these lines represents a visible spectral line of hydrogen atom ?



ⓐ A

ⓑ B

ⓒ C

ⓓ D

12 A transition metal ion X^{3+} its electron configuration is : [Ar] , $3d^4$

What is the atomic number of the element (X) ?

ⓐ 22

ⓑ 24

ⓒ 25

ⓓ 26

13 The chemical formula of the mineral talc (magnesium silicate) is : $Mg_3Si_4O_{10}(OH)_2$

What is the oxidation number of silicon in the mineral talc ?

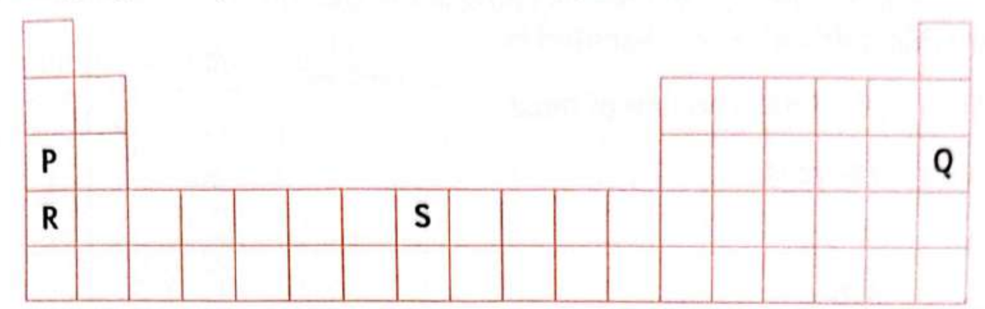
ⓐ −4

ⓑ −2

ⓒ +2

ⓓ +4

14 The following figure represents a section in the periodic table :



What is the proper order which represents the gradual ascending in the metallic property of the illustrated elements in this section ?

ⓐ Q < P < R < S
ⓑ Q < S < P < R
ⓒ S < P < R < Q
ⓓ Q < R < P < S

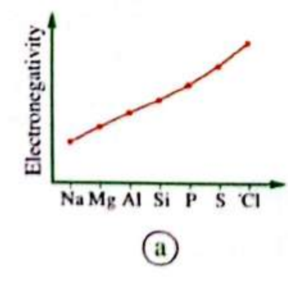
15 Which of the following equations represents the third ionization energy of bismuth Bi element ?

ⓐ $Bi^{+}_{(g)} \longrightarrow Bi^{3+}_{(g)} + e^{-}$
ⓑ $Bi^{2+}_{(s)} \longrightarrow Bi^{3+}_{(s)} + e^{-}$
ⓒ $Bi^{2+}_{(g)} + e^{-} \longrightarrow Bi^{3+}_{(g)}$
ⓓ $Bi^{2+}_{(g)} \longrightarrow Bi^{3+}_{(g)} + e^{-}$

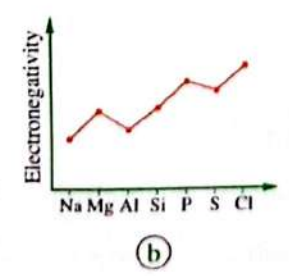
16 What are the assumed quantum numbers of the electron which is added to gallium ($_{31}Ga$) atom when this electron is in its stable state ?

ⓐ $n = 4 , \ell = 1 , m_{\ell} = 0 , m_{s} = +\frac{1}{2}$
ⓑ $n = 3 , \ell = 2 , m_{\ell} = +2 , m_{s} = +\frac{1}{2}$
ⓒ $n = 4 , \ell = 0 , m_{\ell} = 0 , m_{s} = +\frac{1}{2}$
ⓓ $n = 3 , \ell = 0 , m_{\ell} = 0 , m_{s} = -\frac{1}{2}$

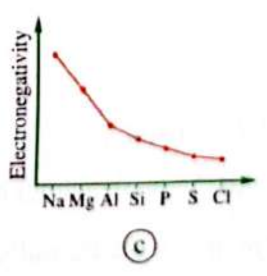
17 Which of the following graphical figures represents the graduation of the electronegativity property in the elements of the third period (excluding argon) ?



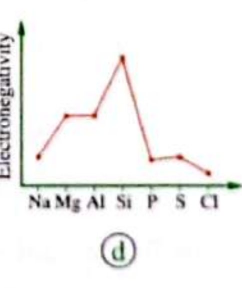
ⓐ



ⓑ



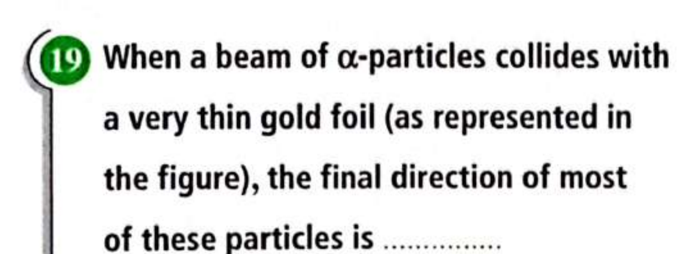
ⓒ



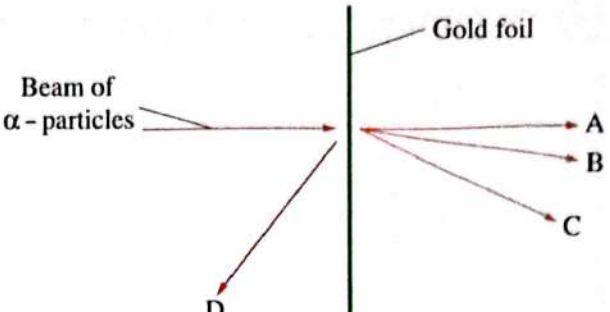
ⓓ

18 The most active nonmetal in the periodic table is the element which is ....

ⓐ the last in group zero.
ⓑ the first in group (7A).
ⓒ the last in group (2A).
ⓓ the first in group (5A).



19 **When a beam of α-particles collides with a very thin gold foil (as represented in the figure), the final direction of most of these particles is ....**



ⓐ A

ⓑ B

ⓒ C

ⓓ D

20 **Which of the following electron configurations violates Pauli's principle ?**

ⓐ [↑↓] [↑↓] [↑↓| |]

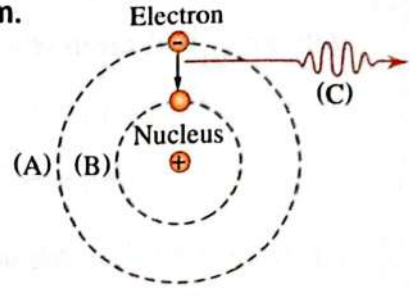
ⓑ [↑↓] [↑] [| |]

ⓒ [↑↓] [↑↑] [↑| |]

ⓓ [↑↓] [↑↓] [↑|↓|]

21 **The opposite figure represents an excited hydrogen atom. What is the name of (C) which is produced from the movement of the electron from level (A) to level (B) ?**





ⓐ Excited electron.

ⓑ Stable electron.

ⓒ Quantum.

ⓓ Visible spectrum.

22 **What is the block** of the elements which contains the highest number of the fifth period elements in the periodic table ?

....

1 mark

23 **Calculate the number** of the orbitals in the principal level (n = 5) which can be occupied by electrons in the actinides.

....

....

.... 1 mark

24 A sample of an organic compound its mass is 10 g is composed of 92.3% C and 7.7% H

What is the percentage of carbon and hydrogen elements in a sample of the same compound its mass is 5 g ? **Explain.**

What is the name of the first scientist who suggested this answer ?

....

....

....

....

....

.... 2 marks

25 **Compare between perbromic acid $HBrO_4$ and hypobromous acid HBrO in terms of :**

(1) Strength of the acid, **with explanation.**

....

....

....

....

....

(2) The oxidation number of bromine in each of them, **with illustration.**

....

....

....

....

.... 2 marks

26 **The following table shows five successive elements which are located in one period in the periodic table :**

(A)	(B)	(C)	(D)	(E)
[Ne] , $3s^1$		....		

(1) **Write** the electronic configuration of the element (C) in its position in the previous table, **with writing** the quantum numbers of the last electron in element (D) atom.

....

....

(2) **Write** the symbolic equation which represents the reaction of one of the oxides of element (E) with water.

....



27 **Calcium element and strontium element are located in the second group in the periodic table :**

(1) **Why** is the ionic radius of strontium Sr^{2+} smaller than its atomic radius ?

....

....

....

....

(2) **What** is the number of the orbitals which are occupied by electrons in calcium atom in its ground state ?

....

....



Exam model 15 Open Book

Answered

Choose the correct answer for the questions (1) : (21)

(1) Which of the following statements about the groups of the periodic table is correct ?

(a) All groups contain metals and nonmetals.

(b) The elements in the same group have the same number of electrons.

(c) The chemical activity of the elements of group (1A) decreases by increasing the number of protons.

(d) H^+ is easier to be separated from the halogen acids with increasing the atomic number of the halogen.

(2) All the following represent main transition elements, except ....

(a) $_{41}Z$

(b) Y : [Ar] , $4s^2, 3d^1$

(c) W : [Xe] , $6s^2, 4f^{14}, 5d^1$

(d) $_{110}X$

(3) Chlorine element forms 4 oxygenated acids, which are :

($HClO$ / $HClO_2$ / $HClO_4$ / $HClO_3$)

What is the oxidation number of chlorine in the strongest acid ?

(a) +7 (b) +5

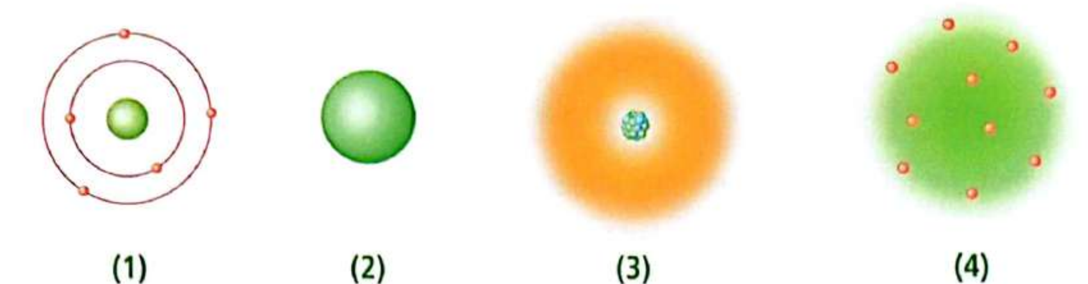
(c) +3 (d) +1

(4) The opposite figure represents a section in the periodic table. Which of the following represents the electronegativity for these elements ?

		$_{33}As$		
$_{49}In$	$_{50}Sn$	$_{51}Sb$	$_{52}Te$	$_{53}I$
		$_{83}Bi$		

Choices	The most electronegative element	The least electronegative element
(a)	As	Bi
(b)	I	In
(c)	I	Bi
(d)	Te	Sn

5 The following figures represent 4 atomic models :



(1) (2) (3) (4)

What is the correct historical order of these models ?

ⓐ (3) ⟶ (1) ⟶ (4) ⟶ (2)

ⓑ (2) ⟶ (1) ⟶ (4) ⟶ (3)

ⓒ (4) ⟶ (2) ⟶ (1) ⟶ (3)

ⓓ (2) ⟶ (4) ⟶ (1) ⟶ (3)

6 What are the quantum numbers of the eighth electron in oxygen atom ?

ⓐ $n = 2, \ell = 1, m_\ell = -1, m_s = -\frac{1}{2}$

ⓑ $n = 2, \ell = 1, m_\ell = +1, m_s = +\frac{1}{2}$

ⓒ $n = 2, \ell = 1, m_\ell = +1, m_s = -\frac{1}{2}$

ⓓ $n = 2, \ell = 0, m_\ell = -1, m_s = +\frac{1}{2}$

7 An element has the electron configuration : $[Xe], 4f^{14}, 5d^2, 6s^2$

What is the location of this element in the periodic table ?

ⓐ Sixth period, group (1).

ⓑ Sixth period, group (2).

ⓒ Sixth period, group (4).

ⓓ Sixth period, group (17).

8 Each of the following determines the type of the element according to its electron configuration, <u>except</u> ....

Choices	Electron configuration	Type of the element
ⓐ	$ns^{1:2}$ or ns^2, np^6	Representative
ⓑ	$1s^2$ or ns^2, np^6	Noble gas
ⓒ	$(n-1)d^{1:9}, ns^{1 \text{ or } 2}$	Main transition
ⓓ	$(n-2)f^{1:14}, (n-1)d^{1 \text{ or } 0}, ns^2$	Inner transition

9 The radius of Li^+ ion is close to that of ....

ⓐ Na^+ ion.

ⓑ Be^{2+} ion.

ⓒ Mg^{2+} ion.

ⓓ Al^{3+} ion.

10 **Which of the following processes is accompanied by releasing energy ?**

ⓐ $Sc_{(g)} \longrightarrow Sc^{+}_{(g)} + e^{-}$

ⓑ $F_{(g)} \longrightarrow F^{+}_{(g)} + e^{-}$

ⓒ $N_{(g)} - e^{-} \longrightarrow N^{-}_{(g)}$

ⓓ $Br_{(g)} + e^{-} \longrightarrow Br^{-}_{(g)}$

11 **All the following oxides behave similarly during the chemical reactions, except** ....

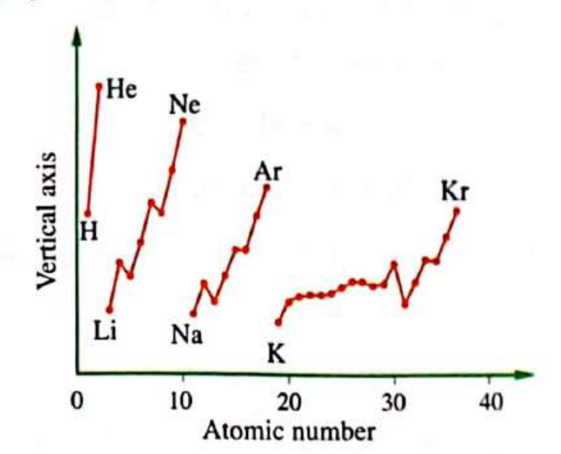
ⓐ MgO
ⓑ SnO
ⓒ ZnO
ⓓ PbO

12 **Which of the following energy sublevels does not actually exist ?**

ⓐ *2p*
ⓑ *3d*
ⓒ *5d*
ⓓ *3f*

13 **What is the property which is represented by the vertical axis in the opposite graphical figure ?**

ⓐ Atomic radius.
ⓑ Electron affinity.
ⓒ The first ionization potential.
ⓓ Electronegativity.



14 **Germanium Ge is located in the same group of carbon and silicon in the periodic table. Which of the following choices represents the correct formulae of the different compounds of germanium ?**

Choices	Germanium chloride	Germanium hydride	Germanium oxide
ⓐ	GeCl	GeH	GeO
ⓑ	GeCl	GeH_4	GeO_2
ⓒ	$GeCl_4$	GeH	GeO
ⓓ	$GeCl_4$	GeH_4	GeO_2

15 What is the change which happens when a phosphorus atom $_{15}P$ is converted to a phosphide ion ?

Choices	Number of unpaired electrons	Total number of electrons
ⓐ	Increases	Increases
ⓑ	Decreases	Increases
ⓒ	Increases	Does not change
ⓓ	Decreases	Does not change

16 How does the strength of the elements as reducing agents change through the third period from Na to Ar ?

ⓐ Decreases regularly.
ⓑ Increases regularly.
ⓒ Decreases then increases.
ⓓ Increases then decreases.

17 What is the ascending graduation of the following elements in terms of the atomic radius ?

ⓐ Cs < Na < Mg < Ba
ⓑ Mg < Na < Ba < Cs
ⓒ Mg < Ba < Na < Cs
ⓓ Ba < Mg < Na < Cs

18 In which of the following elements the orbitals of *5d* sublevel are occupied by electrons ?

ⓐ $_{47}Ag$
ⓑ $_{56}Ba$
ⓒ $_{63}Eu$
ⓓ $_{77}Ir$

19 Which of the following transition of the electron of hydrogen atom produces visible light emission ?

ⓐ $(n = 1) \longrightarrow (n = 2)$.
ⓑ $(n = 5) \longrightarrow (n = 2)$.
ⓒ $(n = 3) \longrightarrow (n = 4)$.
ⓓ $(n = 3) \longrightarrow (n = 1)$.

20 Which of the following is among the conclusions of Rutherford's experiment ?

ⓐ Electrons revolve around the nucleus in definite orbitals.
ⓑ The mass and the positive charge of the atom are concentrated in its center.
ⓒ The atoms of the same element are similar in mass.
ⓓ The electron is a particle with mass and has the properties of waves.

21 Use the following redox reaction to answer the question :

$$MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

During the reaction, electrons transfer from ....

ⓐ $Fe^{3+} \longrightarrow Fe^{2+}$

ⓑ $Fe^{2+} \longrightarrow MnO_4^-$

ⓒ $MnO_4^- \longrightarrow Fe^{2+}$

ⓓ $MnO_4^- \longrightarrow Mn^{2+}$

22 The following table illustrates the ionization potentials (from the fifth to the eighth) of two elements (X) and (Y) in the third period in the periodic table :

Element	Ionization potentials (kJ/mol)			
	Fifth	Sixth	Seventh	Eighth
(X)	+7012	+8496	+27107	+31671
(Y)	+6542	+9362	+11018	+33606

(1) **What** is the number of the group of element (Y) ? **Explain.**

....

....

....

(2) **Write** the electronic configuration of the element (X) according to aufbau principle.

....

.... 2 marks

23 The opposite figure represents one of the postulates of an atomic theory that you studied :

5.55 g of hydrogen gas

Combination

44.4 g of oxygen gas

49.95 g of water

(1) **What** is the name of this theory ?

....

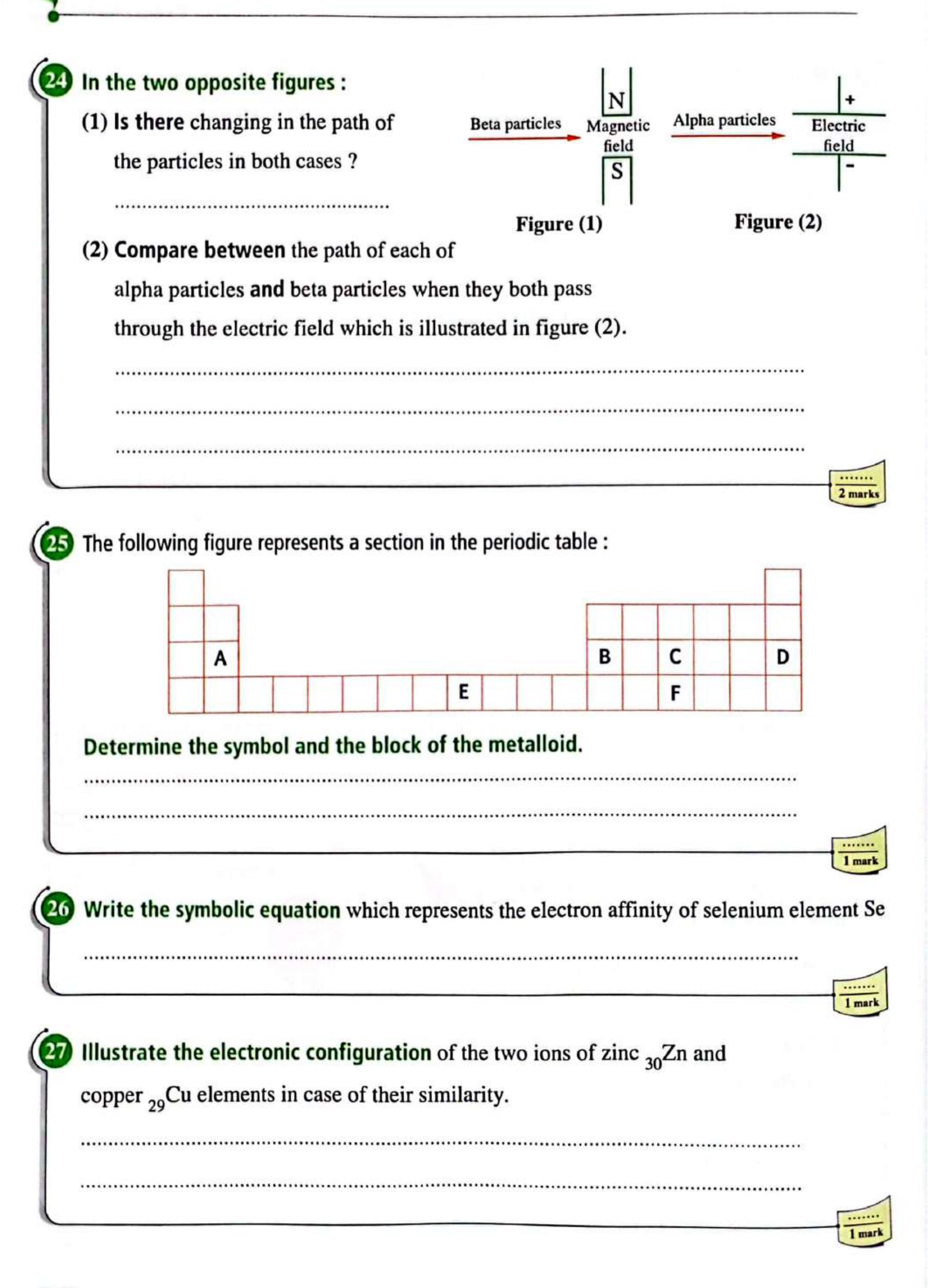
(2) **State** the postulate which is represented in the figure.

....

....

....





24 **In the two opposite figures :**

(1) **Is there** changing in the path of the particles in both cases ?

....

Figure (1) Figure (2)

(2) **Compare between** the path of each of alpha particles **and** beta particles when they both pass through the electric field which is illustrated in figure (2).

....

....

....

.... 2 marks

25 The following figure represents a section in the periodic table :

Determine the symbol and the block of the metalloid.

....

....

.... 1 mark

26 **Write the symbolic equation** which represents the electron affinity of selenium element Se

....

.... 1 mark

27 **Illustrate the electronic configuration** of the two ions of zinc $_{30}Zn$ and copper $_{29}Cu$ elements in case of their similarity.

....

....

.... 1 mark

Answers of the questions of 2021 exam

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	d	a	c	d	d	c	c	b	a

Question number	11	12	13	14	15	16	17	18	19	20
Answer	b	d	c	a	d	b	a	c	d	a

Question number	21
Answer	b

Answers of the questions of 2020 exam

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	a	d	b	c	d	a	b	d	d

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	b	c	b	c	c	c	d	a	b

Question number	21	22	23	24	25	26	27	28	29	30
Answer	a	a	a	d	d	d	a	c	b	d

Question number	31	32	33	34	35	36	37	38	39
Answer	d	a	c	a	a	b	d	b	a

Answers of the guiding model

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	b	a	d	c	b	a	a	b	a

Question number	11	12
Answer	c	c

Answers of exam model 1

Question number	1	2	3	4	5	6	7	8	9	10
Answer	b	d	d	a	c	c	b	a	b	a

Question number	11	12	13	14	15	16	17	18	19	20
Answer	c	c	d	d	a	c	b	d	c	a

Question number	21
Answer	a

22 Oxidation number of the element = +2

Because the electronic configuration of the element ends with the sublevel ns^2, so its atom tends to lose two electrons to give a positive ion that carries two positive charges.

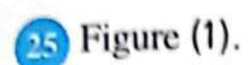
23 Electron (X) / As the sum of $(n + \ell)$ of $4f$ sublevel $(4 + 3 = 7)$ of the electron (X) is higher than the sum of $(n + \ell)$ of $6s$ sublevel $(6 + 0 = 6)$ of the electron (Y).

24 **(1)** ∵ Number of elements of s-block = 12 elements.

Number of elements of p-block = 36 elements.

∴ The difference between them = 36 – 12 = 24 elements.

(2) Elements of f-block.



(25) Figure (1).

(26) $_{23}V$: $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^2$, $3d^3$

Number of completely filled orbitals = 1 + 1 + 3 + 1 + 3 + 1 = 10 orbitals.

Number of partially occupied orbitals = 3 orbitals.

(27) $(n = 4)$, $(\ell = 1)$, $(m_\ell = -1)$, $(m_s = +\frac{1}{2})$.

Answers of exam model (2)

Question number	1	2	3	4	5	6	7	8	9	10
Answer	a	c	c	b	d	b	c	a	a	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	c	b	a	b	b	b	a	c	d

Question number	21
Answer	c

(22) $_{21}Sc$: [Ar] , $4s^2$, $3d^1$

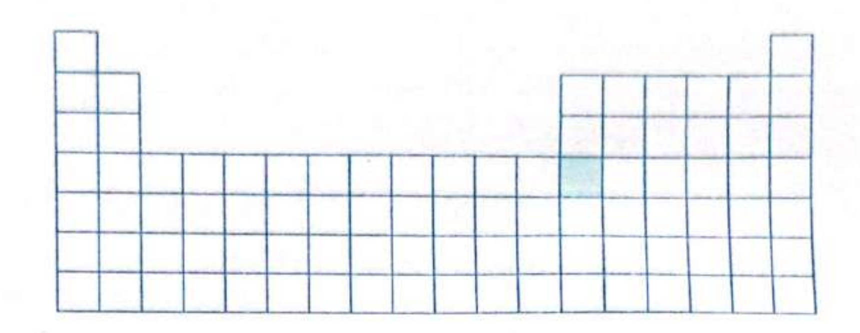
The second set / As it represents the electron of $4s$ sublevel that occupies the 4^{th} energy level which is the farthest from the nucleus.

(23) **(1)** ∵ Number of representative elements = 43 elements.

Number of main transition elements = 40 elements.

∴ The difference between them = 43 – 40 = 3 elements.

(2)



24 (1) (C) (2) (D)

25 $NaClO_3$ / Where the oxidation number of chlorine = +5

26 $Al_2O_{3(s)} + 3H_2SO_{4(aq)} \longrightarrow Al_2(SO_4)_{3(aq)} + 3H_2O_{(\ell)}$

27 HClO / n = Zero

Answers of exam model 

Question number	1	2	3	4	5	6	7	8	9	10
Answer	b	c	d	c	a	c	d	b	a	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	c	a	d	d	a	a	b	c	b	d

Question number	21
Answer	b



22 ∵ The electron configuration of element X ends with the sublevel $4s^1$

∴ X is potassium $_{19}K$

∴ KOH is ionized as a base, as its atomic size is large, and its ion carries one positive charge, so its attraction to oxygen ion O^{2-} decreases, and (O – H) bond becomes stronger than (K – O) bond, and hence negative hydroxide ion is formed.

$$KOH \longrightarrow K^+ + OH^-$$

23 The electrons are deflected towards the positive electrode / As they are negatively charged.

24 $_{24}$**Cr** : [Ar] , $4s^1$, $3d^5$ $_{25}$**Mn** : [Ar] , $4s^2$, $3d^5$

Yes / Due to the similarity between chromium and manganese, where the atom is more stable when *3d* sublevel is half filled with electrons.

25 **(1)** • **(X):** MgO • **(Y):** H_2SO_4

(2) $MgO_{(s)} + H_2SO_{4(aq)} \longrightarrow MgSO_{4(aq)} + H_2O_{(l)}$

Compound (X) Compound (Y) Compound (Z)

26 Element (X) / As it requires to be excited to absorb an amount of energy sufficient for the electron to transfer from the lower energy level (n = 2) to the higher energy level (n = 6).

27 **(1)** The bond length in the molecule of hydrogen chloride

$= r\,(H) + r\,(Cl) = 0.3 + 0.99 = 1.29$ Å

(2) The bond length in the formula unit of sodium chloride

$= r\,(Na^+) + r\,(Cl^-) = 0.95 + 1.81 = 2.76$ Å

Answers of exam model 4

Question number	1	2	3	4	5	6	7	8	9	10
Answer	c	d	c	d	a	a	c	d	c	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	c	b	a	d	c	b	a	d	a

Question number	21
Answer	b

22 **The electronic configuration :** $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^1$

Atomic number = 13

23 **The electronic configuration of the element :** [Ne] , $3s^2$, $3p^4$

∴ The element is located in the third period, group 6A (16).

24 [Ar] , $4s^2$, $3d^{10}$, $4p^3$

25 **(1)** Zero.

(2) Zinc (Zn) and sulphur (S) combine together to form zinc sulphide.

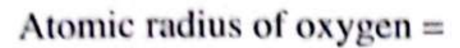
26 Atomic radius of hydrogen = $\frac{\text{Bond length in hydrogen molecule}}{2}$

$r(H) = \frac{0.6}{2} = 0.3$ Å

Atomic radius of nitrogen =

Bond length in NH_3 molecule – Atomic radius of hydrogen

$r(N) = 1 - 0.3 = 0.7$ Å



Atomic radius of oxygen =

Bond length in H_2O molecule – Atomic radius of hydrogen

r (O) = 0.96 – 0.3 = 0.66 Å

Bond length in NO molecule =

Atomic radius of nitrogen + Atomic radius of oxygen

r (N) + r (O) = 0.7 + 0.66 = 1.36 Å

27 (1) The atomic numbers of these elements.

(2) All of them are metalloids.

Answers of exam model 5

Question number	1	2	3	4	5	6	7	8	9	10
Answer	c	b	b	d	a	c	b	d	d	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	b	c	c	a	d	d	d	d	b

Question number	21
Answer	b

22 **Bromine :** – 324.5

Iodine : – 295

23 Each principal energy level consists of a number of energy sublevels equals its number (n value = Number of ℓ values).

24 (1) Dalton's theory.

(2) Compounds are formed by the combination of atoms of different elements in a simple numerical ratio.

25 $Rb_2O_{(s)} + H_2O_{(l)} \longrightarrow 2RbOH_{(aq)}$

26 (1) **The electronic configuration :** $1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^1$

$\therefore$ The atomic number = 13

(2) Group number 3A (13).

27 $r(O) = \frac{1.32}{2} = 0.66$ Å

$r(H) = 0.96 - 0.66 = 0.3$ Å

$2r(H_2) = 2 \times 0.3 = 0.6$ Å

Answers of exam model 

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	b	d	b	c	d	b	b	b	c

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	a	a	c	c	c	d	c	b	c

Question number	21
Answer	b

22 $n = 5 \quad , \quad l = 1 \quad , \quad m_l = 0 \quad , \quad m_s = +\frac{1}{2}$

23 $n = 3 \quad , \quad l = 0 \quad , \quad m_l = 0 \quad , \quad m_s = +\frac{1}{2}$



24 The orbital.

25 Because the values of the electron affinity of these elements are nearly zero, where the atom becomes more stable when the sublevels :

- *1s* , *2s* , *3s* are completely filled as in He , Be , Mg
- *2p* , *3p* are completely filled as in Ne , Ar
- *2p* is half filled as in N

And adding a new electron to any of these atoms decreases its stability.

26 (1) (B) and (C).

(2) The charge of the nucleus is similar to the charge of positive alpha particles, so it repels them on approaching to it.

27 (1) * SO_2 oxide.

* **Oxidation number :** $\overset{?}{S}\overset{-2}{O_2}$, $S + (-2 \times 2) = 0$, $\therefore S = +4$

(2) * Cl_2O oxide.

* **The equation :** $Cl_2O + H_2O \longrightarrow 2HClO$

Answers of exam model 7



Question number	1	2	3	4	5	6	7	8	9	10
Answer	c	a	c	b	c	d	d	c	b	c

Question number	11	12	13	14	15	16	17	18	19	20
Answer	c	c	c	c	d	c	b	b	d	d

Question number	21
Answer	b

22 Zero / As potassium is among the elements of group (1A), where the oxidation number of any metal in this group in its compounds = +1

23 2 electrons.

24 No / Because the ionization potential of phosphorus $_{15}P$ is higher than that of sulphur $_{16}S$ despite the fact that it precedes sulphur in the same period.

$_{15}$**P :** [Ne] , $3s^2$, $3p^3$

$_{16}$**S :** [Ne] , $3s^2$, $3p^4$

This is because the atom is more stable when *3p* sublevel is half filled as in case of phosphorus, so removing an electron from this atom decreases its stability.

25 Q / s-block.

26 **(1)** (1) CO_2

(2) H_2O

(3) K_2CO_3

(2) The oxygenated acid : H_2CO_3

The hydroxy formula : $CO(OH)_2$

n = 1 , m = 2

27 **(1)** (1) Cl – Cl

(2) I – I

(3) Br – Br

(4) F – F

(2) r (H) + r (Cl) = 0.3 + 0.99 = 1.29 Å

Answers of exam model 8

Question number	1	2	3	4	5	6	7	8	9	10
Answer	b	b	c	d	d	a	c	d	b	d

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	a	b	d	a	d	c	c	d	c

Question number	21
Answer	d

22 XCl_2

23 Sulphuric acid H_2SO_4 / As it is more active, where the number of oxygen atoms nonbinded with hydrogen in sulphuric acid $SO_2(OH)_2$ is higher than in $ClO(OH)_2$

24 Number of the representative elements in the first period = 1 element.
Number of the representative elements in the second period = 7 elements.
The difference between them = 7 – 1 = 6 elements.

25 **(1)** (1) $1s^1$ (2) $1s^2, 2s^2, 2p^3$

(2) Zero.

26

Quantum numbers	n	ℓ	m_ℓ	m_s
First electron	2	1	–1	$+\frac{1}{2}$
Second electron	2	1	–1	$-\frac{1}{2}$

27 **(1)** Dalton's theory.

(2) The element is composed of very minute particles called atoms.

Answers of exam model 9

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	c	a	d	c	a	a	b	c	c

Question number	11	12	13	14	15	16	17	18	19	20
Answer	b	c	c	c	d	a	a	c	c	b

Question number	21
Answer	a

22 ∵ The electronic configuration of the element ends with $3p^4$ sublevel.

∴ The element is located in the third period, group 6A (16).

23 X : $1s^2, 2s^2, 2p^6, 3s^1$

Y : $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$

Z : $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$

Element X / Because this results in breaking a completely filled energy level.

24 **Sulphuric acid :** $SO_2(OH)_2$

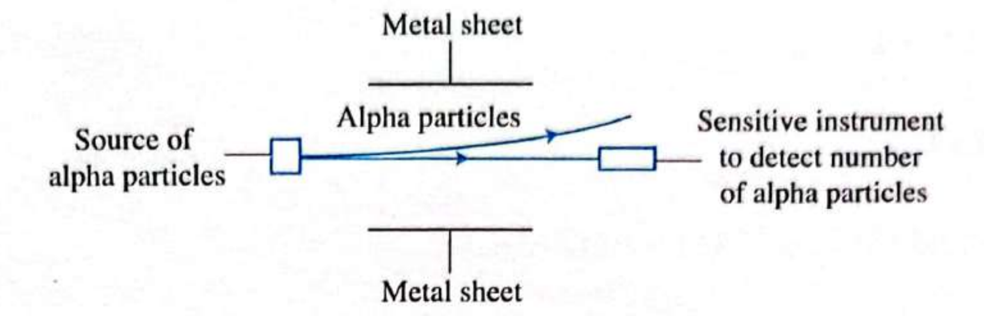
Sulphurous acid : $SO(OH)_2$

∴ Sulphuric acid is more acidic / As the strength of the oxygenated acid increases by increasing the number of nonbinded oxygen atoms with hydrogen.





25 **(1)**



(2) The reading of the sensitive instrument decreases.

26 r (H) = 1.29 – 0.99 = 0.3 Å

2r (H_2) = 2 × 0.3 = 0.6 Å

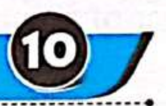
r (N) = 1 – 0.3 = 0.7 Å

2r (N_2) = 2 × 0.7 = 1.4 Å

∴ Bond length in nitrogen molecule (N_2) is longer than that in hydrogen molecule (H_2).

27 **Cr :** $4s^1$, $3d^5$ **Cu :** $4s^1$, $3d^{10}$

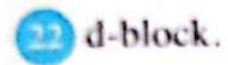
Answers of exam model 10



Question number	1	2	3	4	5	6	7	8	9	10
Answer	c	c	a	a	d	d	b	a	d	d

Question number	11	12	13	14	15	16	17	18	19	20
Answer	c	d	d	d	a	c	d	b	c	b

Question number	21
Answer	b

 d-block.

23 HO

24 Acid (3) > Acid (1) > Acid (2).

25

	First group	Second group
Elements	1, 2, 4, 5	3, 6
Type of elements	Representative elements	Noble elements

26 $\overset{0}{P} \xrightarrow{\text{Oxidation}} H_3\overset{+5}{P}O_4$, $H\overset{+1}{Cl}O \xrightarrow{\text{Reduction}} H\overset{-1}{Cl}$

Reducing agent : P , **Oxidizing agent : HClO**

27 **(1) The electronic configuration :** $1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^6 , 4s^2 , 3d^{10} , 4p^3$

Number of completely filled orbitals = 1 + 1 + 3 + 1 + 3 + 1 + 5

= 15 orbitals.

(2) 3 electrons.



Answers of exam model 11

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	c	c	c	c	a	b	d	c	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	d	a	b	d	a	b	c	b	d	a

Question number	21
Answer	a

22. No / Due to the similarity of the two electrons of *1s* sublevel in all four quantum numbers.

23. M : $1s^2$, $2s^2$, $2p^6$, $3s^1$
Because the second ionization potential of the element M is very high, where it causes breaking of a completely filled energy level.

24. $\overset{+5}{(ClO_3)^-} \xrightarrow{\text{Reduction}} \overset{-1}{Cl^-}$, $\overset{-1}{I^-} \xrightarrow{\text{Oxidation}} \overset{0}{I_2}$

Oxidizing agent : $(ClO_3)^-$ **Reducing agent :** I^-

25. Figure (2) / Bohr.

26. **(1)** • **The electronic configuration :** $1s^2$, $2s^2$, $2p^3$
• **The location :** Second period, group 5A (15).
(2) p-block.

27. **(1)** 29 elements.
(2) [Ar] , $4s^2$, $3d^{10}$, $4p^2$

Answers of exam model 12

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	c	d	c	d	d	c	d	a	c

Question number	11	12	13	14	15	16	17	18	19	20
Answer	b	a	d	a	d	a	b	c	b	c

Question number	21
Answer	c

22 Because *p* sublevel contains three orbitals, each orbital is filled with 2 electrons.

23 Co^{3+} : [Ar] , $4s^0$, $3d^6$ ⥮ ↑ ↑ ↑ ↑

∴ **Number of unpaired electrons :** 4 electrons.

24 Representative, main transition, inner transition and noble elements.

25 **(1)** Dalton's theory.

(2) Masses of the atoms of the same element are similar, but they differ from an element to another.

26 **(1)** First ionization potential.

(2) Used in detecting invisible alpha particles, where it flashes when these particles collide with it.

27 **(1)** ∵ **The hydroxy formula of the acid :** $PO(OH)_3$

∴ Number of nonbinded oxygen atoms with hydrogen in this acid = 1

(2) $3MgO + 2H_3PO_4 \longrightarrow Mg_3(PO_4)_2 + 3H_2O$



Answers of exam model 13

Question number	1	2	3	4	5	6	7	8	9	10
Answer	c	a	c	d	a	b	a	d	b	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	d	d	c	b	c	c	d	b	d	d

Question number	21
Answer	c

22 $r(Li^+) + r(Cl^-) = 0.68 + 1.81 = 2.49$ Å

23 Yes / As the cathode rays move in straight lines.

24 B, C and D / Because the excited electron transfers in the atom from higher energy level to lower energy level (its ground state).

25 **(1)** 3A (13) **(2)** +6

26 **(1)** ∵ **Compound (Y)** : $ZnSO_4$

∴ The electronic configuration of the cation Zn^{2+} : [Ar] , $3d^{10}$

(2) Sodium zincate.

27 **(1) Case (1)** : $\ell = 0$, $m_\ell = 0$

Case (2) : $\ell = 1$, $m_\ell = 0$

(2) n = 1

Answers of exam model 14

Question number	1	2	3	4	5	6	7	8	9	10
Answer	b	a	a	c	d	d	a	a	c	b

Question number	11	12	13	14	15	16	17	18	19	20
Answer	c	c	d	b	d	a	a	b	a	c

Question number	21
Answer	c

22 d-block.

23 ∵ **Sublevels :** *5s* , *5p* , *5d* , *5f*

∴ Number of orbitals = 1 + 3 + 5 + 7 = 16 orbitals.

24 7.7% (H) : 92.3% (C)

As the proportions (ratios) of the components of the compound remain constant, no matter how different its mass, according to Dalton's postulate.

25 **(1)** Perbromic acid ($BrO_3(OH)$) is stronger than hypobromous acid (BrOH), as the strength of the acid increases by increasing the number of nonbinded oxygen atoms with hydrogen.

(2) $\overset{+1}{H}\overset{?}{Br}\overset{-2}{O}$, $1 + Br - 2 = 0$ $\therefore Br = +1$

$\overset{+1}{H}\overset{?}{Br}\overset{-2}{O_4}$, $1 + Br + (-2 \times 4) = 0$ $\therefore Br = +7$

26 **(1) The electronic configuration of the element (C) :** [Ne] , $3s^2$, $3p^1$

The quantum numbers of the last electron in the atom of the element (D)

$n = 3$, $\ell = 1$, $m_\ell = 0$, $m_s = +\frac{1}{2}$

(2) $E_2O_5 + 3H_2O \longrightarrow 2H_3EO_4$

27 (1) Because increasing the number of positive protons more than that of negative electrons results in increasing the nucleus effective charge leading to decreasing the size of the ion.

(2) Ca : $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$

Number of orbitals = 1 + 1 + 3 + 1 + 3 + 1 = 10 orbitals.

Answers of exam model 15

Question number	1	2	3	4	5	6	7	8	9	10
Answer	d	c	a	b	d	a	c	a	c	d

Question number	11	12	13	14	15	16	17	18	19	20
Answer	a	d	c	d	b	a	b	d	b	b

Question number	21
Answer	b

22 **(1)** 7A (17) / Because the 8th ionization potential of element (Y) is much higher than its 7th ionization potential.

(2) **(X) :** $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^4$

23 **(1)** Dalton's theory.

(2) Compounds are formed by the combination of atoms of different elements in simple numerical ratios.

24 **(1)** Yes.

(2) **Alpha particles :** Are deflected slightly towards the negative electrode.

Beta particles : Are deflected significantly towards the positive electrode.

25 **Symbol :** F

Block : p

26 $Se_{(g)} + e^- \longrightarrow Se^-_{(g)}$ + Energy , $\Delta H = (-)$

27 $_{29}Cu^+$: [Ar] , $3d^{10}$

$_{30}Zn^{2+}$: [Ar] , $3d^{10}$



كيفية طباعة صفحات معينة من ملف معين



مثلا ازاى نطبع الصفحات من صفحة 4 الى صفحة 9

خطوة 1

خطوة 2
اختيار اسم الطابعة بتاعتك

خطوة 3
كتابة الصفحات المراد طباعتها
نكتب رقم 4 ثم نكتب الشرطة دي – ثم نكتب 9

خطوة 4
اختيار نوع الورق

خطوة 5
اختيار A4

خطوة 6